TOREX

SHORT FORM English | 2019

RoHS Compliant

Halogen Antimony FREE

Global Network

TOREX SEMICONDUCTOR
—supplying cutting edge,
high performance power supply ICs
to every corner of the world.

TOREX

A specialist in Analog power supply IC design, development and manufacturing.

Marketing & Development

Quickly turning designers' ideas
into reality.
Providing innovative solutions
by combining creativity
with marketing expertise.

TOREX SEMICONDUCTOR was established in 1995 and has been meeting worldwide market demands ever since, by offering analog CMOS ICs that provide low current consumption, low operating voltage and are supplied in ultra miniature packages.

TOREX is unique in that it focuses its leading edge CMOS analog technology on battery-powered applications.

Our facilities, located not only in Japan, but throughout Asia, Europe and USA ensure that TOREX maintains a high level of communication with customers throughout the world, enabling us to deliver solutions that are both innovative and appropriate to our customer's needs.

Torex Products

High quality,
high precision products
to support
new innovation.

Quality Management

Earning Customers trust with the world's
highest levels of quality control
and environmentally friendly products.

SHORT FORM

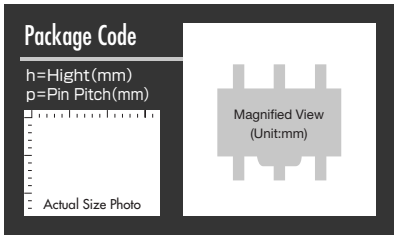
2019

TOREX...*Powerfully Small!*

Contents

Packaging

■ Package Information



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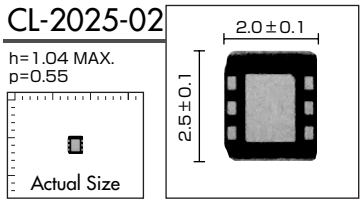

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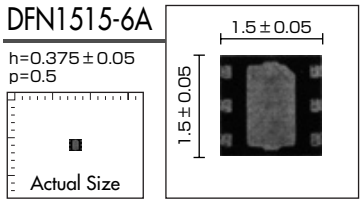

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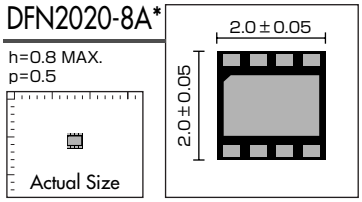

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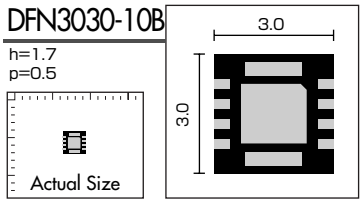

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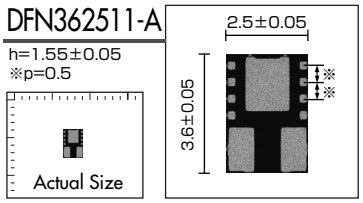

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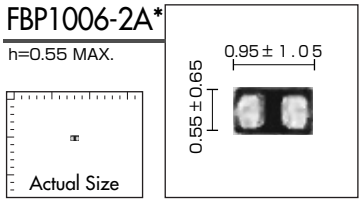

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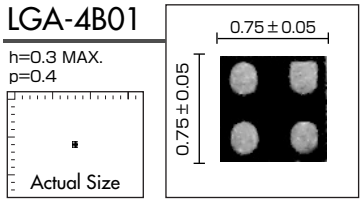

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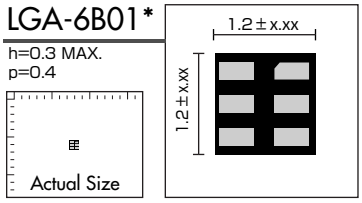

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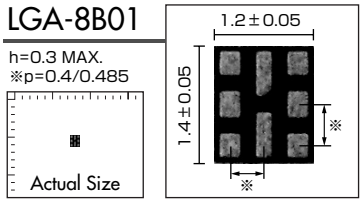

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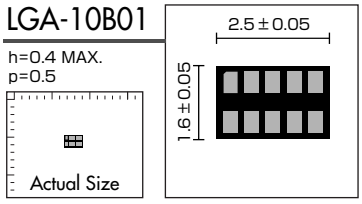

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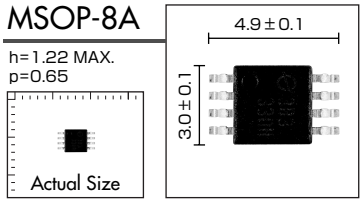

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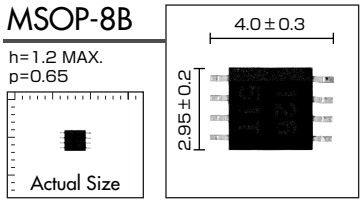

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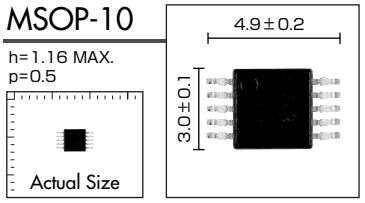

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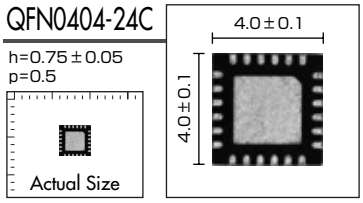

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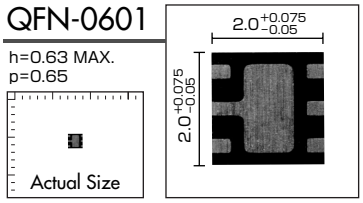

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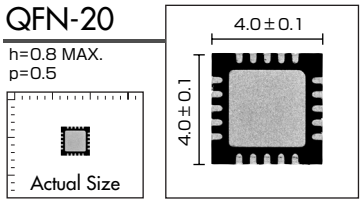

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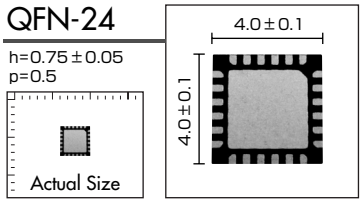

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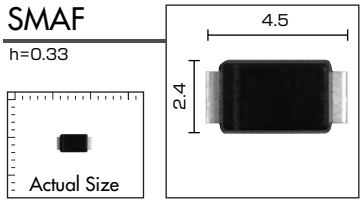

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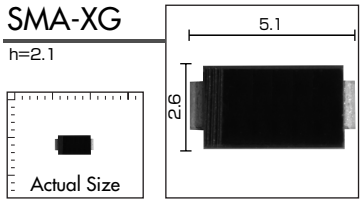

SMBF

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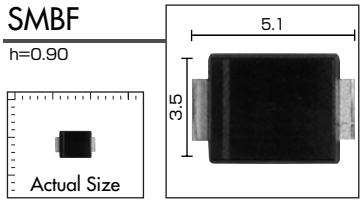

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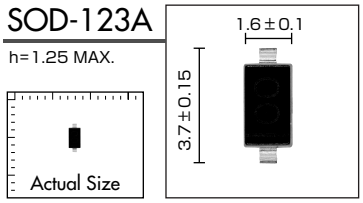

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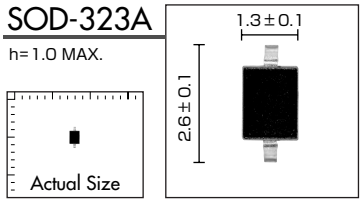

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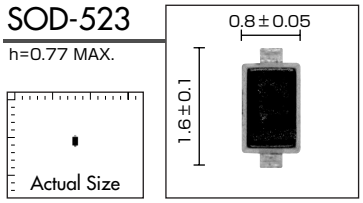

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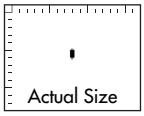

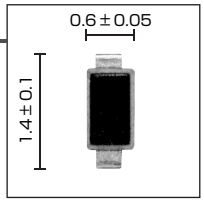

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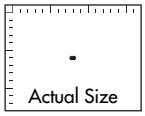

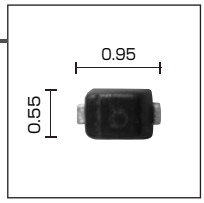

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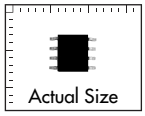

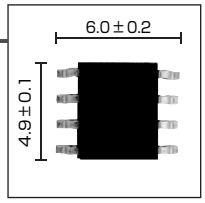

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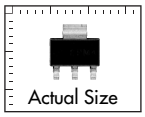

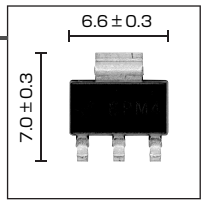

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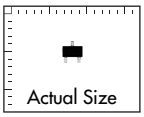

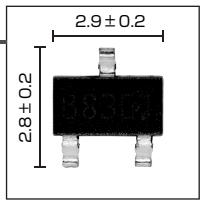

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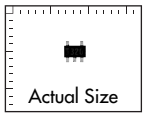

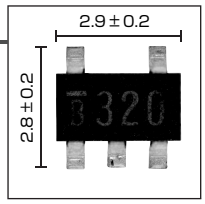

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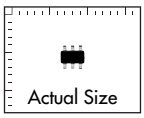

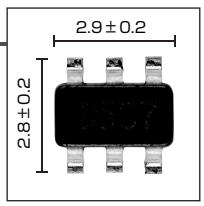

SOT-26W

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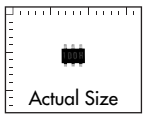

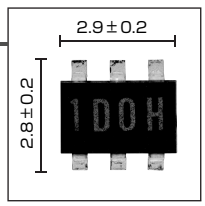

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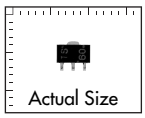

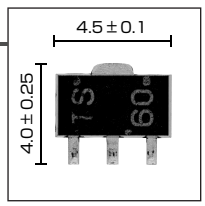

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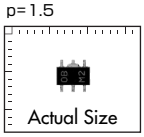

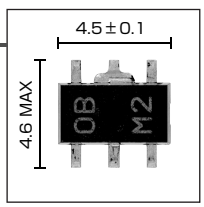

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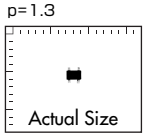

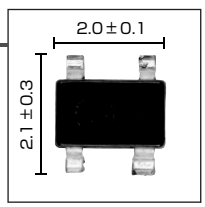

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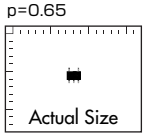

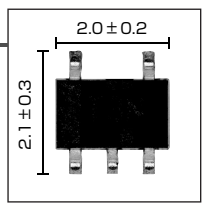

TO-252

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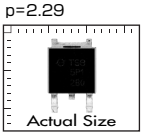

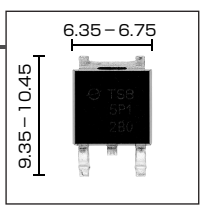

TSOT-26

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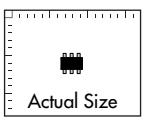

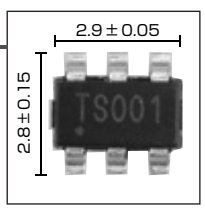

TSSOP-16

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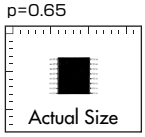
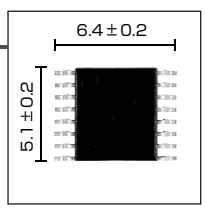
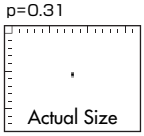
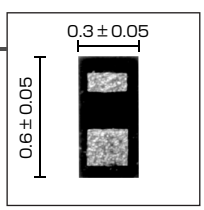




USP-2B01

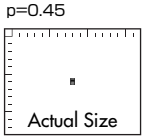
h=0.33 MAX.
p=0.31

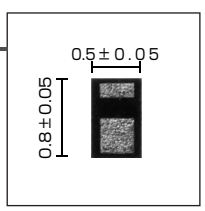




USP-2B02

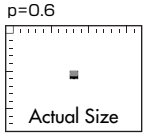
h=0.3±0.03
p=0.45

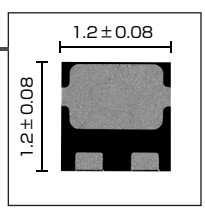




USP-3

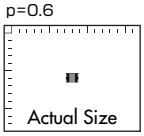
h=0.6 MAX.
p=0.6

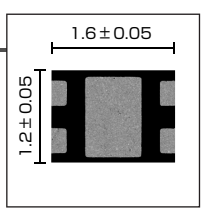




USP-4/USP-4D

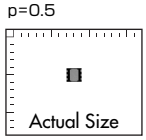
h=0.6 MAX.
p=0.6

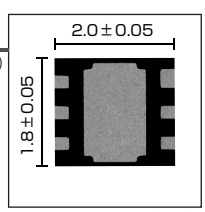




USP-6B/USP-6C

h=0.6 MAX. ※(0.7 MAX)
p=0.5





※USP-6B

USPN-6B01

h=0.4 MAX.
※p=0.5

USP-6B06

h=0.33 MAX.
p=0.5

USP-6B07

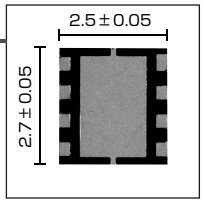
h=0.33 MAX.
p=0.55

USP-6EL

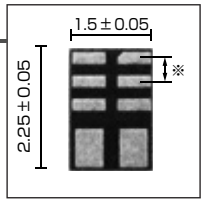
h=0.4 MAX.
p=0.55

*Under development

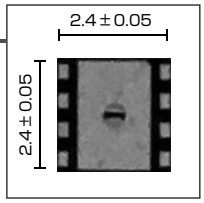
USP-8
h=0.6 MAX.
p=0.65
Actual Size



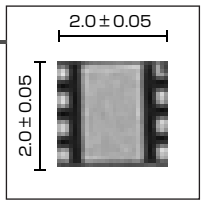
USP-8B04
h=0.70±0.05
※p=0.43
Actual Size



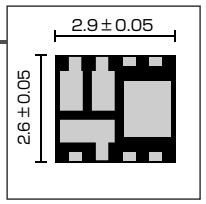
USP-8B05
h=0.33±0.3
p=0.6
Actual Size



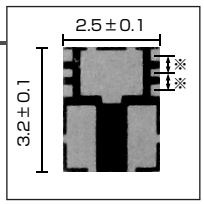
USP-8B06
h=0.33 MAX.
p=0.5
Actual Size



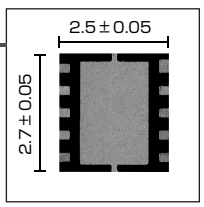
USP-8B10
h=0.33 MAX.
p=0.65
Actual Size



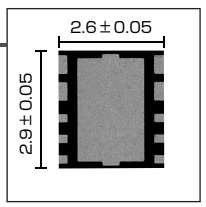
USP-9B01
h=1.0±0.05
※p=0.45
Actual Size



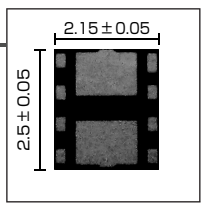
USP-10
h=0.6 MAX.
p=0.5
Actual Size



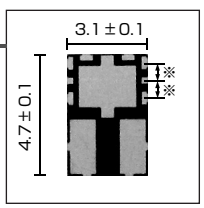
USP-10B
h=0.6 MAX.
p=0.65/0.5
Actual Size



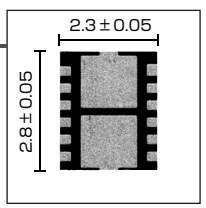
USP-10B03
h=1.0±0.05
p=0.65
Actual Size



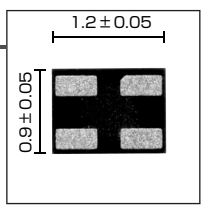
USP-11B01
h=1.35 MAX.
※p=0.675
Actual Size



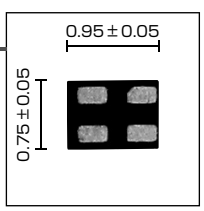
USP-12B01
h=0.6 MAX.
p=0.4
Actual Size



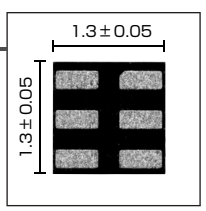
USPN-4
h=0.4 MAX.
p=0.55
Actual Size



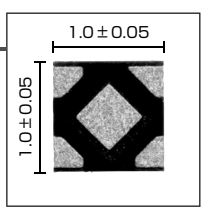
USPN-4B02
h=0.4 MAX.
p=0.4
Actual Size



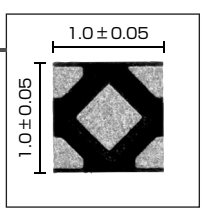
USPN-6
h=0.4 MAX.
p=0.45
Actual Size



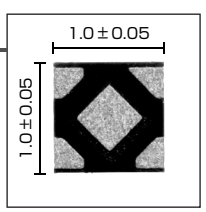
USPQ-4B03
h=0.4 MAX.
p=0.65
Actual Size



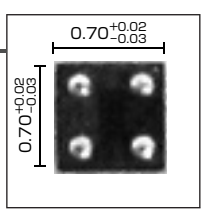
USPQ-4B04
h=0.6 MAX.
p=0.65
Actual Size



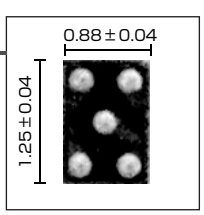
USPQ-4B05
h=0.33 MAX.
p=0.65
Actual Size



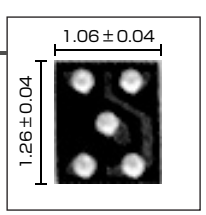
WLP-4-01
h=0.2 MAX.
p=0.4
Actual Size



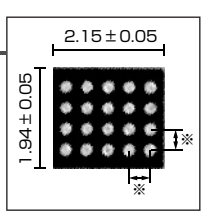
WLP-5-02
h=0.4 MAX.
p=0.5
Actual Size



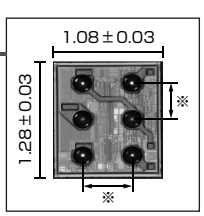
WLP-5-03
h=0.4 MAX.
p=0.5
Actual Size



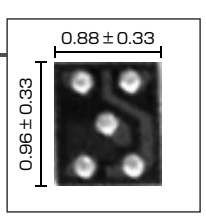
WLP-20-01
h=0.625 MAX.
※p=0.4
Actual Size



WLP-6-01
h=0.4 MAX.
※p=0.4/0.5
Actual Size

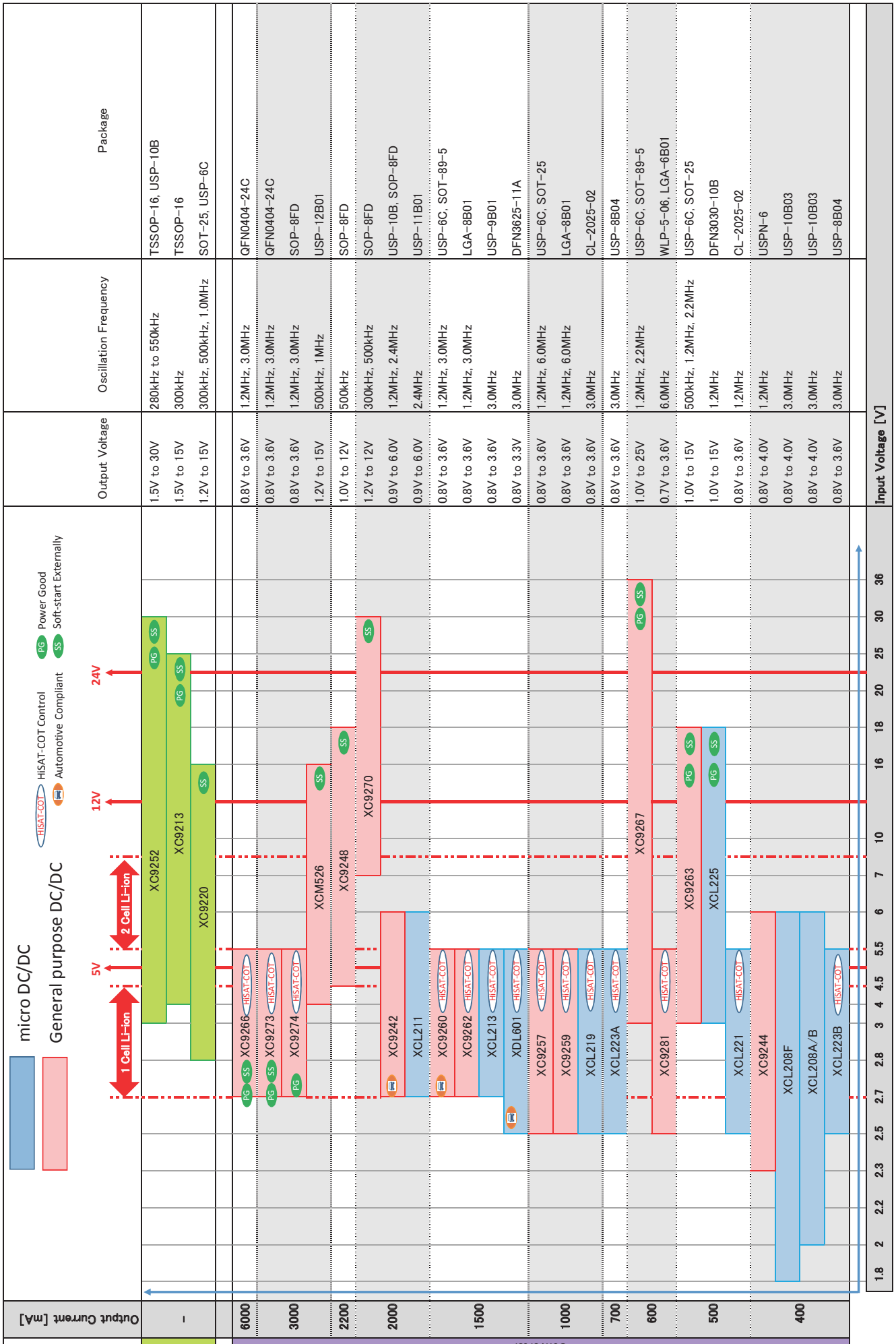


WLP-5-06
h=0.33 MAX.
p=0.5
Actual Size



*Under development

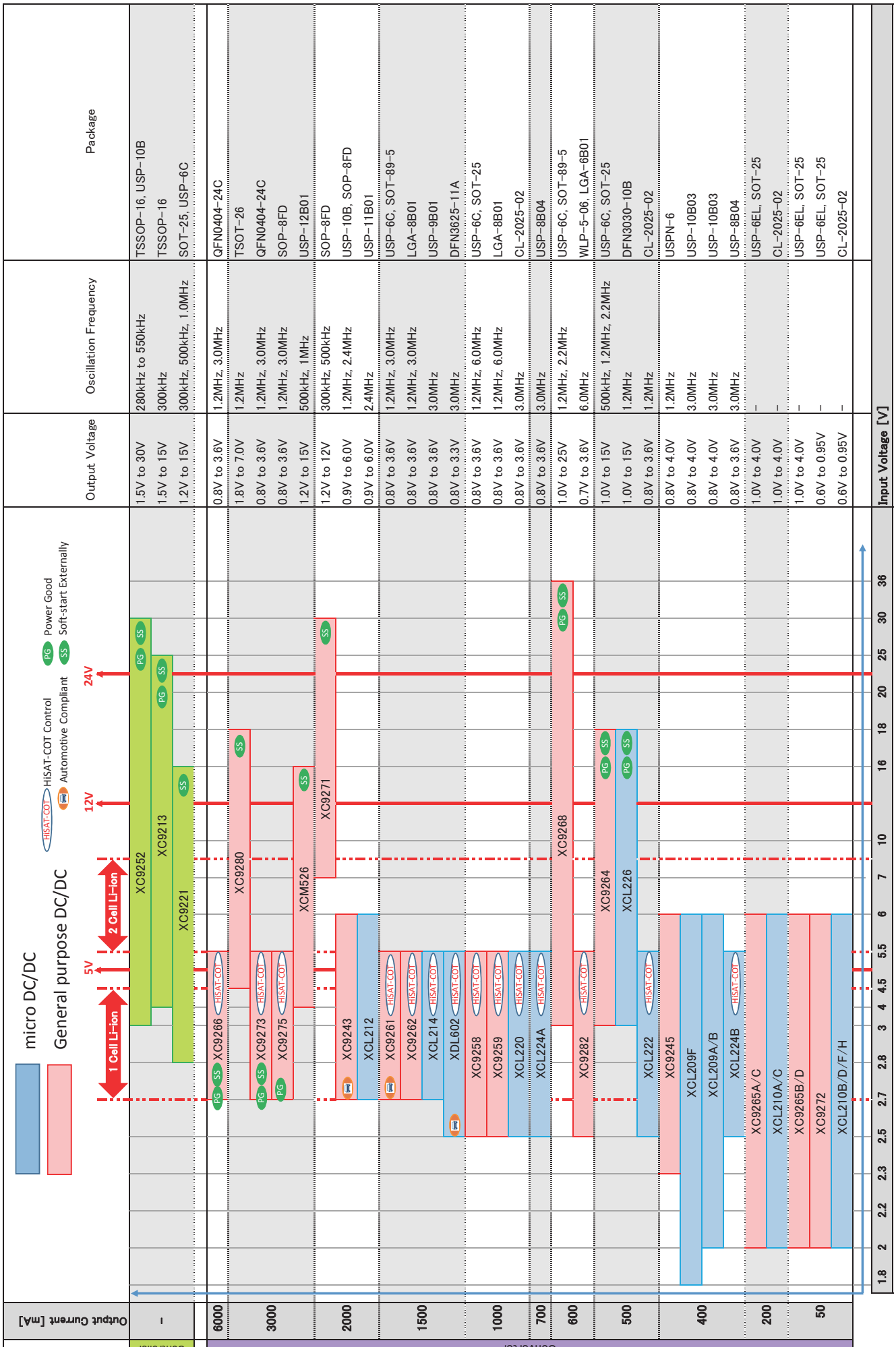
■ Step-Down DC/DC PWM Control



■ Step-Down DC/DC PWM Control

	Series	Control Method	Vin [V]	Vout [V]	Iout [mA]	fosc [Hz]	Function			Ta max.	Package	Function		Page
							HiSAT-COT	External FET/SBD	Vout Setting			Protection	Other	
Low Voltage DC/DC : Input Voltage 6V or lower	XCL223A	PWM	2.5～5.5	0.8～3.6	700	3.0M	Yes	–	Vout	105℃	USP-8B04	TSD/Lim/Short	SS/UVLO/Discharge	2
	XCL223B	PWM	2.5～5.5	0.8～3.6	400	3.0M	Yes	–	Vout	105℃	USP-8B04	TSD/Lim/Short	SS/UVLO/Discharge	2
	XCL221	PWM	2.5～5.5	0.8～3.6	500	1.2M	Yes	–	Vout	105℃	CL-2025-02	TSD/Lim/Short	SS/UVLO/Discharge	3
	XCL219	PWM	2.5～5.5	0.8～3.6	1000	3.0M	Yes	–	Vout	105℃	CL-2025-02	TSD/Lim/Short	SS/UVLO/Discharge	4
	XCL213	PWM	2.7～5.5	0.8～3.6	1500	3.0M	Yes	–	Vout	105℃	USP-9B01	TSD/Lim/Short	SS/UVLO/Discharge	5
	XCL211	PWM	2.7～6.0	0.9～6.0	2000	2.4M	–	–	FB	85℃	USP-11B01	TSD/Lim	SS/UVLO/Discharge	6
	XCL208A/B	PWM	2.0～6.0	0.8～4.0	400	3.0M	–	–	Vout	85℃	USP-10B03	Lim/Short	SS/UVLO/Discharge	8
	XCL208F	PWM	1.8～6.0	0.8～4.0	400	3.0M	–	–	FB	85℃	USP-10B03	Lim/Short	SS/UVLO/Discharge	8
	XC9281	PWM	2.5～5.5	0.7～3.6	600	6.0M	Yes	–	Vout	105℃	LGA-6B01 WLP-5-06	Lim	UVLO/SS/Discharge	12
	XC9274	PWM	2.7～5.5	0.8～3.6	3000	1.2M 3.0M	Yes	–	FB	105℃	SOP-8FD	TSD/Lim/Short or Hiccup	UVLO/SS/Soft off/PG/Discharge	15
	XC9273	PWM or PWM/PFM	2.7～5.5	0.8～3.6	3000	1.2M 3.0M	Yes	–	FB	105℃	QFN0404-24C	TSD/Lim/Short or Hiccup	UVLO/SS adj./Soft off/PG/Discharge	14
	XC9266	PWM or PWM/PFM	2.7～5.5	0.8～3.6	6000	1.2M 3.0M	Yes	–	FB	105℃	QFN0404-24C	TSD/Lim/Short or Hiccup	UVLO/SS adj./Soft off/PG/Discharge	19
	XC9262	PWM or PWM/PFM	2.7～5.5	0.8～3.6	1500	1.2M 3.0M	Yes	–	Vout	105℃	LGA-8B01	TSD/Lim/Short	SS/UVLO/Discharge	22
	XC9260	PWM	2.7～5.5	0.8～3.6	1500	1.2M 3.0M	Yes	–	Vout	105℃	SOT-89-5 USP-6C	TSD/Lim/Short	SS/UVLO/Discharge	23
	XC9259	PWM or PWM/PFM	2.5～5.5	0.8～3.6	1000	1.2M 6.0M	Yes	–	Vout	105℃	LGA-8B01	TSD/Lim/Short	SS/UVLO/Discharge	24
	XC9257	PWM	2.5～5.5	0.8～3.6	1000	1.2M 6.0M	Yes	–	Vout	105℃	SOT-25 USP-6C	TSD/Lim/Short	SS/UVLO/Discharge	25
	XC9244	PWM	2.3～6.0	0.8～4.0	400	1.2M	–	–	Vout	85℃	USPN-6	Lim	SS/UVLO/Discharge	28
	XC9242	PWM	2.7～6.0	0.9～6.0	2000	1.2M 2.4M	–	–	FB	85℃	USP-10B SOP-8FD	TSD/Lim	SS/UVLO/Discharge	29
	XDL601 (AEC-Q100)	PWM	2.5～5.5	0.8～3.3	1500	3.0M	Yes	–	Vout	105℃	DFN3625-11A	TSD/Lim/Short	SS/UVLO/Discharge	135
	XD9260 (AEC-Q100)	PWM	2.7～5.5	0.8～3.6	1500	1.2M 3.0M	Yes	–	Vout	105℃	USP-6C	TSD/Lim/Short	SS/UVLO/Discharge	136
	XD9242 (AEC-Q100)	PWM	2.7～6.0	0.9～6.0	2000	1.2M 2.4M	–	–	FB	85℃	USP-10B	TSD/Lim	SS/UVLO/Discharge	137
Middle Voltage DC/DC : Input Voltage 18V or lower	XCL225	PWM	3.0～18.0	1.0～15.0	500	1.2M	–	–	FB	105℃	DFN3030-10B	TSD/Lim	SS adj./UVLO/PG	1
	XC9263	PWM	3.0～18.0	1.0～15.0	500	500k 1.2M 2.2M	–	–	FB	105℃	SOT-25 USP-6C	TSD/Lim	SS adj./UVLO/PG	21
	XC9248	PWM	4.5～18.0	1.0～12.0	2200	500k	–	–	FB	105℃	SOP-8FD	Lim/Short/TSD/Short	SS adj./UVLO/Discharge	27
	XC9220	PWM	2.8～16.0	1.2～15.0	3000	300k 500k 1.0M	–	Pch+SBD	FB	85℃	SOT-25 USP-6C	Lim/Short	SS adj./UVLO	30
	XCM526	PWM or PWM/PFM	4.0～16.0	1.2～15.0	3000	500k 1.0M	–	SBD	FB	85℃	USP-12B01	Short	SS adj./UVLO	32
High Voltage DC/DC : Input Voltage 36V or lower	XC9270	PWM	7.0～30.0	1.2～12.0	2000	300k 500k Ext CLK	–	SBD	FB	105℃	SOP-8FD	TSD/Lim/Short	SS adj./UVLO/SYNC	17
	XC9267	PWM	3.0～36.0	1.0～25.0	600	1.2M 2.2M	–	–	FB	105℃	SOT-89-5 USP-6C	TSD/Lim	SS adj./UVLO/PG	18
	XC9252	PWM or PWM/PFM	3.0～30.0	1.5～30.0	10000	Adj.(280k～550k) Ext CLK	–	Pch+SBD	FB	105℃	TSSOP-16 USP-10B	TSD/Lim/Short	SS adj./UVLO/PG/SYNC	26
	XC9213	PWM or PWM/PFM	4.0～25.0	1.5～15.0	5000	300k	–	Nch+Nch	FB	85℃	TSSOP-16	Lim/Short	SS adj./UVLO	31

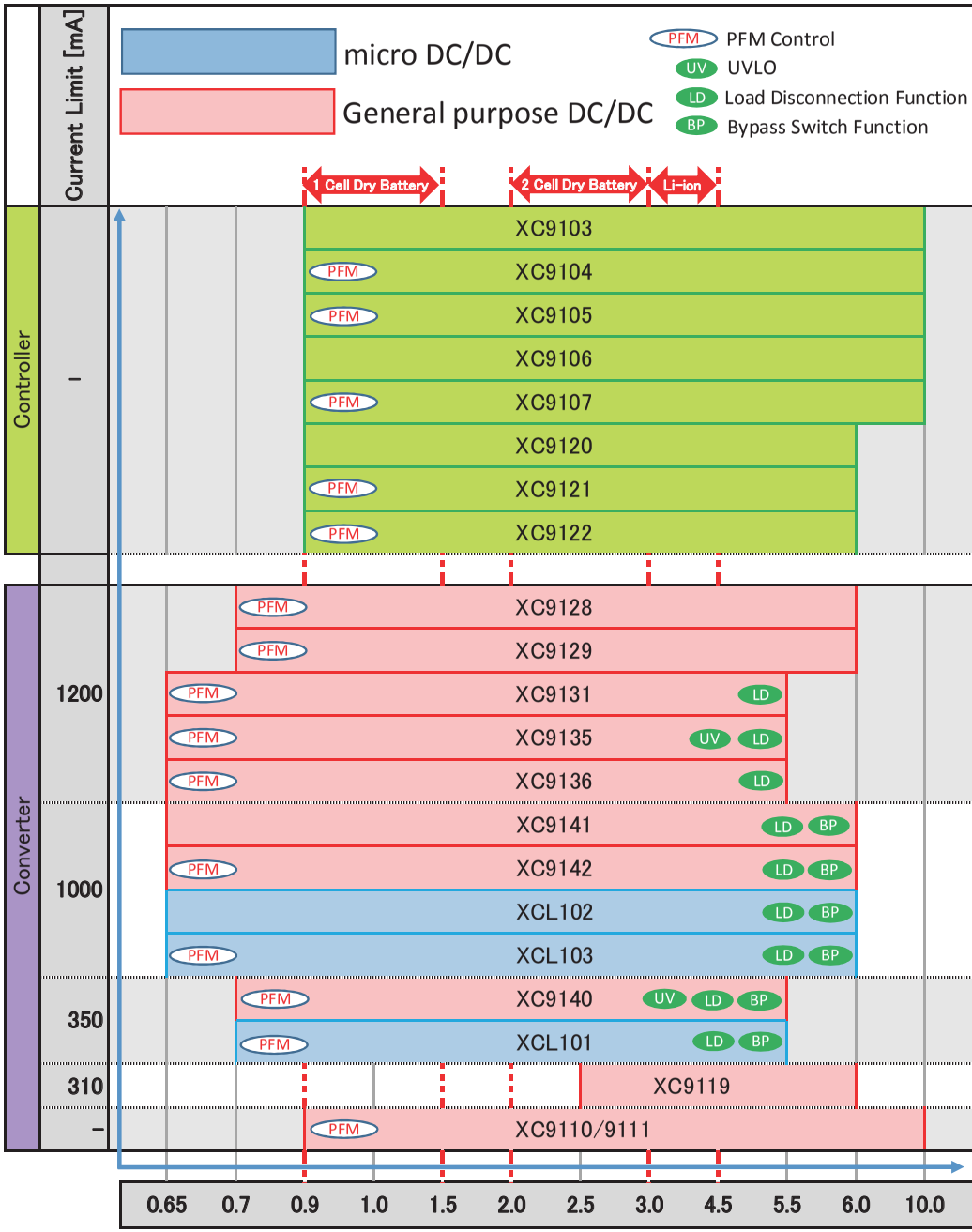
■ Step-Down DC/DC PFM Control



■ Step-Down DC/DC PFM Control

	Series	Control Method	Vin [V]	Vout [V]	Iout [mA]	fosc [Hz]	Function			Ta max.	Package	Function		Page
							HiSAT-COT	External FET/SBD	Vout Setting			Protection	Other	
Low Voltage DC/DC : Input Voltage 6V or lower	XCL224A	PWM/PFM	2.5～5.5	0.8～3.6	700	3.0M	Yes	–	Vout	105℃	USP-8B04	TSD/Lim/Short	SS/UVLO/Discharge	2
	XCL224B	PWM/PFM	2.5～5.5	0.8～3.6	400	3.0M	Yes	–	Vout	105℃	USP-8B04	TSD/Lim/Short	SS/UVLO/Discharge	2
	XCL222	PWM/PFM	2.5～5.5	0.8～3.6	500	1.2M	Yes	–	Vout	105℃	CL-2025-02	TSD/Lim/Short	SS/UVLO/Discharge	3
	XCL220	PWM/PFM	2.5～5.5	0.8～3.6	1000	3.0M	Yes	–	Vout	105℃	CL-2025-02	TSD/Lim/Short	SS/UVLO/Discharge	4
	XCL214	PWM/PFM	2.7～5.5	0.8～3.6	1500	3.0M	Yes	–	Vout	105℃	USP-9B01	TSD/Lim/Short	SS/UVLO/Discharge	5
	XCL212	PWM/PFM	2.7～6.0	0.9～6.0	2000	2.4M	–	–	FB	85℃	USP-11B01	TSD/Lim	SS/UVLO/Discharge	6
	XCL210F/H	PFM	2.0～6.0	0.6～0.95	50	–	–	–	Vout	85℃	CL-2025-02	Short	UVLO/Discharge	7
	XCL210A-D	PFM	2.0～6.0	1.0～4.0	200	–	–	–	Vout	85℃	CL-2025-02	Short	UVLO/Discharge	7
	XCL209A/B	PWM/PFM	2.0～6.0	0.8～4.0	400	3.0M	–	–	Vout	85℃	USP-10B03	Lim/Short	SS/UVLO/Discharge	8
	XCL209F	PWM/PFM	1.8～6.0	0.8～4.0	400	3.0M	–	–	FB	85℃	USP-10B03	Lim/Short	SS/UVLO/Discharge	8
	XC9282	PWM/PFM	2.5～5.5	0.7～3.6	600	6.0M	Yes	–	Vout	105℃	LGA-6B01 WLP-5-06	Lim/Short	UVLO/SS/Discharge	12
	XC9275	PWM/PFM	2.7～5.5	0.8～3.6	3000	1.2M 3.0M	Yes	–	FB	105℃	SOP-8FD	TSD/Lim/Short or Hiccup	UVLO/SS/Soft off/PG/Discharge	15
	XC9273	PWM or PWM/PFM	2.7～5.5	0.8～3.6	3000	1.2M 3.0M	Yes	–	FB	105℃	QFN0404-24C	TSD/Lim/Short or Hiccup	UVLO/SS/Soft off/PG/Discharge	14
	XC9272	PFM	2.0～6.0	0.6～0.95	50	–	–	–	Vout	85℃	SOT-25 USP-6EL	Short	UVLO/Discharge	16
	XC9266	PWM or PWM/PFM	2.7～5.5	0.8～3.6	6000	1.2M 3.0M	Yes	–	FB	105℃	QFN0404-24C	TSD/Lim/Short or Hiccup	UVLO/SS/Soft off/PG/Discharge	19
	XC9265	PFM	2.0～6.0	1.0～4.0	200	–	–	–	Vout	85℃	SOT-25 USP-6EL	Short	UVLO/Discharge	20
	XC9262	PWM or PWM/PFM	2.7～5.5	0.8～3.6	1500	1.2M 3.0M	Yes	–	Vout	105℃	LGA-8B01	TSD/Lim/Short	SS/UVLO/Discharge	22
	XC9261	PWM/PFM	2.7～5.5	0.8～3.6	1500	1.2M 3.0M	Yes	–	Vout	105℃	SOT-89-5 USP-6C	TSD/Lim/Short	SS/UVLO/Discharge	23
	XC9259	PWM or PWM/PFM	2.5～5.5	0.8～3.6	1000	1.2M 6.0M	Yes	–	Vout	105℃	LGA-8B01	TSD/Lim/Short	SS/UVLO/Discharge	24
	XC9258	PWM/PFM	2.5～5.5	0.8～3.6	1000	1.2M 6.0M	Yes	–	Vout	105℃	SOT-25 USP-6C	TSD/Lim/Short	SS/UVLO/Discharge	25
	XC9245	PWM/PFM	2.3～6.0	0.8～4.0	400	1.2M	–	–	Vout	85℃	USPN-6	Lim	SS/UVLO/Discharge	28
	XC9243	PWM/PFM	2.7～6.0	0.9～6.0	2000	1.2M 2.4M	–	–	FB	85℃	USP-10B SOP-8FD	TSD/Lim	SS/UVLO/Discharge	29
	XDL602 (AEC-Q100)	PWM/PFM	2.5～5.5	0.8～3.3	1500	3.0M	Yes	–	Vout	105℃	DFN3625-11A	TSD/Lim/Short	SS/UVLO/Discharge	135
	XD9261 (AEC-Q100)	PWM/PFM	2.7～5.5	0.8～3.6	1500	1.2M 3.0M	Yes	–	Vout	105℃	USP-6C	TSD/Lim/Short	SS/UVLO/Discharge	136
	XD9243 (AEC-Q100)	PWM/PFM	2.7～6.0	0.9～6.0	2000	1.2M 2.4M	–	–	FB	85℃	USP-10B	TSD/Lim	SS/UVLO/Discharge	137
Middle Voltage DC/DC : Input Voltage 18V or lower	XCL226	PWM/PFM	3.0～18.0	1.0～15.0	500	1.2M	–	–	FB	105℃	DFN3030-10B	TSD/Lim	SS adj./UVLO/PG	1
	XC9280	PWM/PFM	4.5～18.0	1.8～7.0	3000	1.2M	–	–	FB	105℃	TSOT-26	TSD/Lim	UVLO/SS adj.	13
	XC9264	PWM/PFM	3.0～18.0	1.0～15.0	500	500k 1.2M 2.2M	–	–	FB	105℃	SOT-25 USP-6C	TSD/Lim	SS adj./UVLO/PG	21
	XC9221	PWM/PFM	2.8～16.0	1.2～15.0	3000	300k 500k 1.0M	–	Pch+SBD	FB	85℃	SOT-25 USP-6C	Lim/Short	SS adj./UVLO	30
	XCM526	PWM or PWM/PFM	4.0～16.0	1.2～15.0	3000	500k 1.0M	–	SBD	FB	85℃	USP-12B01	Short	SS adj./UVLO	32
High Voltage DC/DC : Input Voltage 36V or lower	XC9271	PWM or PWM/PFM	7.0～30.0	1.2～12.0	2000	300k 500k Ext CLK	–	SBD	FB	105℃	SOP-8FD	TSD/Lim/Short	SS adj./UVLO/SYNC	17
	XC9268	PWM/PFM	3.0～36.0	1.0～25.0	600	1.2M 2.2M	–	–	FB	105℃	SOT-89-5 USP-6C	TSD/Lim	SS adj./UVLO/PG	18
	XC9252	PWM or PWM/PFM	3.0～30.0	1.5～30.0	10000	Adj.(280k～550k) Ext CLK	–	Pch+SBD	FB	105℃	TSSOP-16 USP-10B	TSD/Lim/Short	SS adj./UVLO/PG/SYNC	26
	XC9213	PWM or PWM/PFM	4.0～25.0	1.5～15.0	5000	300k	–	Nch+Nch	FB	85℃	TSSOP-16	Lim/Short	SS adj./UVLO	31

■ Step-Up DC/DC



Current Limit [mA]		Output Voltage	Oscillation Frequency	Package
Controller	–			
	XC9103	1.5V to 30V	100kHz, 180kHz, 300kHz, 500kHz	SOT-25, USP-6B
	XC9104 (PFM)	1.5V to 30V	100kHz, 180kHz, 300kHz, 500kHz	SOT-25, USP-6B
	XC9105 (PFM)	1.5V to 30V	100kHz, 180kHz, 300kHz, 500kHz	SOT-25, USP-6B
	XC9106	1.5V to 30V	100kHz, 300kHz	SOT-25, USP-6B
	XC9107 (PFM)	1.5V to 30V	100kHz, 300kHz	SOT-25, USP-6B
	XC9120	1.5V to 30V	100kHz	SOT-25, USP-6C
	XC9121 (PFM)	1.5V to 30V	100kHz	SOT-25, USP-6C
	XC9122 (PFM)	1.5V to 30V	100kHz	SOT-25, USP-6C
Converter	1200			
	XC9128 (PFM)	1.8V to 5.3V	1.2MHz	MSOP-10, USP-10B
	XC9129 (PFM)	1.8V to 5.3V	1.2MHz	USP-10B
	XC9131 (PFM) (LD)	1.8V to 5.0V	1.2MHz	USP-10B
	XC9135 (PFM) (UV) (LD)	1.8V to 5.0V	1.2MHz	USP-10B
	XC9136 (PFM) (LD)	1.8V to 5.0V	1.2MHz	USP-10B
	1000			
	XC9141 (LD) (BP)	1.8V to 5.5V	1.2MHz, 3.0MHz	SOT-25, USP-6C, WLP-6-01
	XC9142 (PFM) (LD) (BP)	1.8V to 5.5V	1.2MHz, 3.0MHz	SOT-25, USP-6C, WLP-6-01
	XCL102 (LD) (BP)	2.2V to 5.5V	3.0MHz	CL-2025-02
	XCL103 (PFM) (LD) (BP)	2.2V to 5.5V	3.0MHz	CL-2025-02
	350			
	XC9140 (PFM) (UV) (LD) (BP)	1.8V to 5.0V	1.2MHz	SOT-25, USP-6EL
	XCL101 (PFM) (LD) (BP)	1.8V to 5.0V	–	CL-2025, CL2025-02
	310			
	XC9119	2.5V to 19.5V	1.0MHz	SOT-25, USP-6C
	–			
	XC9110/9111 (PFM)	1.5V to 7.0V	100kHz	SOT-25, SOT-23, SOT-89, SOT-89-5

■ Step-Up DC/DC PWM Control

	Series	Control Method	Vin [V]	Vout [V]	Iout [mA]	fosc [Hz]	Function		Ta max.	Package	Function		Page
							External FET/SBD	Vout Setting			Protection	Other	
Low Voltage DC/DC, Charge Pump Output Voltage 7V or lower	XCL102	PWM	0.65～6.0	2.2～5.5	500	3.0M	–	Vout	85℃	CL-2025-02	Lim/Short	SS/LD/Discharge	9
	XC9141	PWM	0.65～6.0	1.8～5.5	500	1.2M 3.0M	–	Vout	85℃	SOT-25 WLP-6-01, USP-6C	Lim/Short	SS/LD/Discharge	33
	XC9136	PWM or PWM/PFM	0.65～5.5	1.8～5.0	600	1.2M	–	Vout	85℃	USP-10B	TSD/Lim	SS/LD/FO/Discharge	35
	XC9135	PWM or PWM/PFM	0.65～5.5	1.8～5.0	600	1.2M	–	Vout	85℃	USP-10B	TSD/Lim	SS/UVLO/LD/FO/Discharge	35
	XC9131	PWM or PWM/PFM	0.65～5.5	1.8～5.0	600	1.2M	–	FB	85℃	USP-10B	TSD/Lim	SS/LD/FO/Discharge	36
	XC9129	PWM or PWM/PFM	0.8～6.0	1.8～5.3	600	1.2M	–	FB	85℃	MSOP-10 USP-10B	TSD/Lim	SS	37
	XC9128	PWM or PWM/PFM	0.8～6.0	1.8～5.3	600	1.2M	–	FB	85℃	MSOP-10 USP-10B	TSD/Lim	SS/AEN/FO	37
	XC9801	PWM	1.8～5.5	2.5～6.0 or Vinx2	30	300k	–	Vout	85℃	MSOP-8A USP-8, USP-8B05	–	–	46
High Voltage DC/DC : Output Voltage 36V or lower	XC9122	PWM or PWM/PFM	0.9～6.0	1.5～30.0	3000	100k	Nch+SBD	FB	85℃	SOT-25 USP-6C	Lim	SS	38
	XC9120	PWM	0.9～6.0	1.5～30.0	3000	100k	Nch+SBD	FB	85℃	SOT-25 USP-6C	Lim	SS	38
	XC9119	PWM	2.5～6.0	2.5～19.5	100	1.0M	SBD	FB	85℃	SOT-25 USP-6C	–	SS adj.	39
	XC9106	PWM	0.9～10.0	1.5～30.0	3000	100k 300k	Nch+SBD	FB	85℃	SOT-25 USP-6B	–	SS	41
	XC9105	PWM or PWM/PFM	0.9～10.0	1.5～30.0	3000	100k/180k/300k/500k	Nch+SBD	FB	85℃	SOT-25 USP-6B	Lim	SS	42
	XC9103	PWM	0.9～10.0	1.5～30.0	3000	100k/180k/300k/500k	Nch+SBD	FB	85℃	SOT-25 USP-6B	Lim	SS	42
LED Back light driver	XC9133	PWM	2.5～6.0	2.5～17.5	100	1.0M	SBD	FB	85℃	SOT-25	Lim/OVP	–	48

■ Step-Up DC/DC PFM Control

	Series	Control Method	Vin [V]	Vout [V]	Iout [mA]	fosc [Hz]	Function		Ta max.	Package	Function		Page
							External FET/SBD	Vout Setting			Protection	Other	
Low Voltage DC/DC, Charge Pump Output Voltage 7V or lower	XCL103	PWM/PFM	0.65～6.0	2.2～5.5	500	3.0M	–	Vout	85℃	CL-2025-02	Lim/Short	SS/LD/Discharge	9
	XCL101	PFM	0.7～5.5	1.8～5.0	100	1.2M	–	Vout	85℃	CL-2025-02	–	UVLO/LD	10
	XC9142	PWM/PFM	0.65～6.0	1.8～5.5	500	1.2M 3.0M	–	Vout	85℃	SOT-25 WLP-6-01, USP-6C	Lim/Short	SS/LD/Discharge	33
	XC9140	PFM	0.7～5.5	1.8～5.0	100	1.2M	–	Vout	85℃	SOT-25 USP-6EL	–	UVLO/LD/Discharge	34
	XC9136	PWM or PWM/PFM	0.65～5.5	1.8～5.0	600	1.2M	–	Vout	85℃	USP-10B	TSD/Lim	SS/LD/FO/Discharge	35
	XC9135	PWM or PWM/PFM	0.65～5.5	1.8～5.0	600	1.2M	–	Vout	85℃	USP-10B	TSD/Lim	SS/UVLO/LD/FO/Discharge	35
	XC9131	PWM or PWM/PFM	0.65～5.5	1.8～5.0	600	1.2M	–	FB	85℃	USP-10B	TSD/Lim	SS/UVLO/LD/FO/Discharge	36
	XC9129	PWM or PWM/PFM	0.8～6.0	1.8～5.3	600	1.2M	–	FB	85℃	MSOP-10 USP-10B	TSD/Lim	SS	37
	XC9128	PWM or PWM/PFM	0.8～6.0	1.8～5.3	600	1.2M	–	FB	85℃	MSOP-10 USP-10B	TSD/Lim	SS/AEN/FO	37
	XC9111	PFM	0.8～10.0	1.5～7.0	70	100k	SBD or SBD+Nch	Vout	85℃	SOT-23, SOT-25 SOT-89, USP-6C	–	–	40
	XC9110	PFM	0.8～10.0	1.5～7.0	70	100k	SBD or SBD+Nch	Vout	85℃	SOT-25 USP-6C	–	–	40
	XC9802	PWM/PFM	1.8～5.5	2.5～6.0 or Vinx2	30	300k	–	Vout	85℃	MSOP-8A USP-8, USP-8B05	–	–	46
High Voltage DC/DC : Output Voltage 36V or lower	XC9122	PWM or PWM/PFM	0.9～6.0	1.5～30.0	3000	100k	Nch+SBD	FB	85℃	SOT-25 USP-6C	Lim	SS	38
	XC9121	PWM/PFM	0.9～6.0	1.5～30.0	3000	100k	Nch+SBD	FB	85℃	SOT-25 USP-6C	Lim	SS	38
	XC9107	PWM/PFM	0.9～10.0	1.5～30.0	3000	100k 300k	Nch+SBD	FB	85℃	SOT-25 USP-6B	–	SS	41
	XC9105	PWM or PWM/PFM	0.9～10.0	1.5～30.0	3000	100k/180k/300k/500k	Nch+SBD	FB	85℃	SOT-25 USP-6B	Lim	SS	42
	XC9104	PWM/PFM	0.9～10.0	1.5～30.0	3000	100k/180k/300k/500k	Nch+SBD	FB	85℃	SOT-25 USP-6B	Lim	SS	42

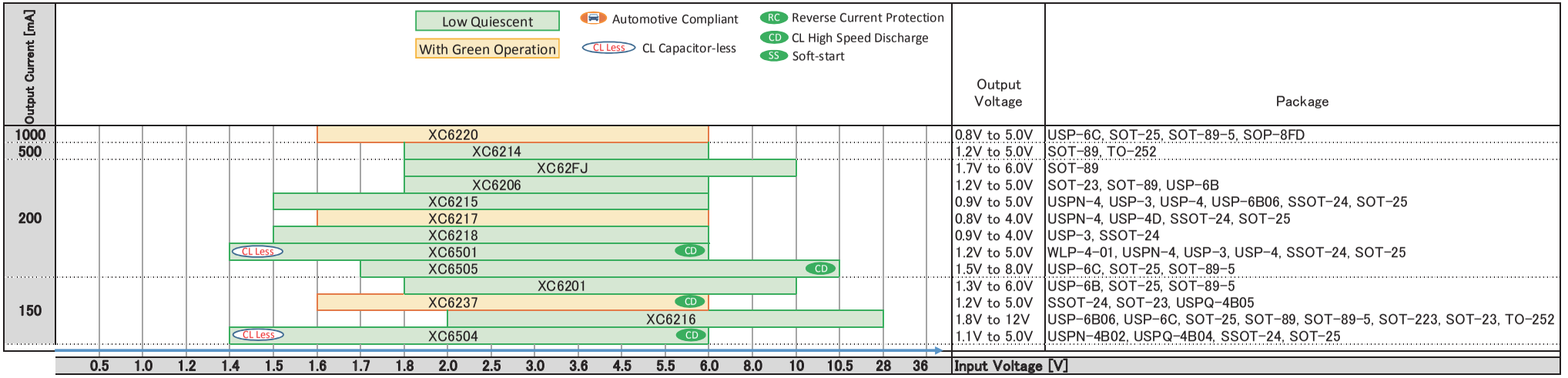
■ Step-Up/Down DC/DC

	Series	Control Method	Vin [V]	Vout [V]	Iout [mA]	fosc [Hz]	Function		Ta max.	Package	Function		Page
							External FET/SBD	Vout Setting			Protection	Other	
Low Voltage DC/DC : Input Voltage 6V or lower	XC9306	PWM or PFM	2.5～5.5	0.8～5.0	800	6.0M	-	FB	85℃	WLP-20-01	TSD/Lim	SS/UVLO	43
Middle Voltage DC/DC : Input Voltage 18V or lower	XC9303	PWM or PWM/PFM	2.0～10.0	2.0～6.0	800	300k	Pch+Nch*2+SBD	FB	85℃	MSOP-8A	-	SS	44
	XC9302	PWM/PFM	2.0～10.0	2.4～6.0	250	180k 300k	Pch+SBD*2	Vout	85℃	SOT-25	-	SS	45
	XC9301	PWM	2.0～10.0	2.4～6.0	250	180k 300k	Pch+SBD*2	Vout	85℃	SOT-25	-	SS	45

■ Negative Voltage DC/DC

	Series	Control Method	Vin [V]	Vout [V]	Iout [mA]	fosc [Hz]	Function		Ta max.	Package	Function		Page
							External FET/SBD	Vout Setting			Protection	Other	
Negative Voltage DC/DC, Inveter Charge Pump	XCL301	PFM/PWM	2.7～5.5	-3.3	50	-	SBD	Vout	85℃	CL-2025-02	Lim	SS/UVLO/Discharge	11
	XC6351A	-	1.2～5.0	-VIN	10	35k 120k	-	-	80℃	SOT-25 USP-6B	-	-	47

■ Voltage Regulator (Low Quiescent)

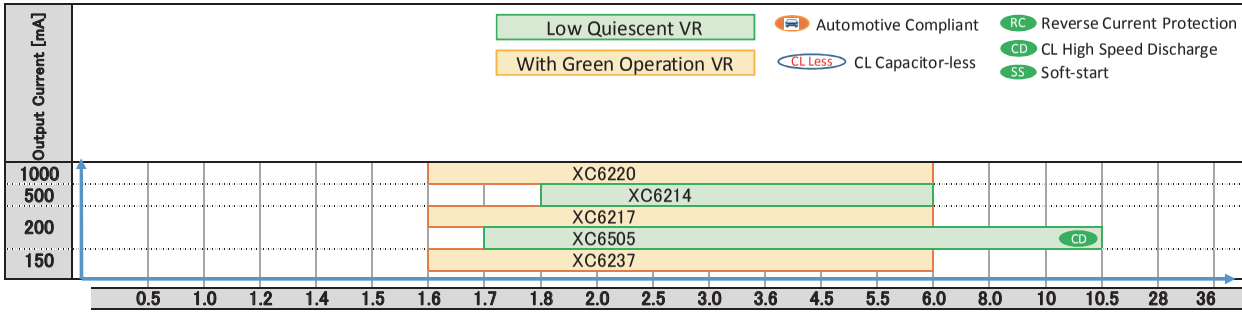


Output Voltage	Package
0.8V to 5.0V	USP-6C, SOT-25, SOT-89-5, SOP-8FD
1.2V to 5.0V	SOT-89, TO-252
1.7V to 6.0V	SOT-89
1.2V to 5.0V	SOT-23, SOT-89, USP-6B
0.9V to 5.0V	USPN-4, USP-3, USP-4, USP-6B06, SSOT-24, SOT-25
0.8V to 4.0V	USPN-4, USP-4D, SSOT-24, SOT-25
0.9V to 4.0V	USP-3, SSOT-24
1.2V to 5.0V	WLP-4-01, USPN-4, USP-3, USP-4, SSOT-24, SOT-25
1.5V to 8.0V	USP-6C, SOT-25, SOT-89-5
1.3V to 6.0V	USP-6B, SOT-25, SOT-89-5
1.2V to 5.0V	SSOT-24, SOT-23, USPQ-4B05
1.8V to 12V	USP-6B06, USP-6C, SOT-25, SOT-89, SOT-89-5, SOT-223, SOT-23, TO-252
1.1V to 5.0V	USPN-4B02, USPQ-4B04, SSOT-24, SOT-25

■ Voltage Regulator (Low Quiescent)

	Series	Vin [V]	Vout [V]	Vout Accuracy	Iout [mA]	Iss [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Ta max.	Package	Page
									CE	Current Limit	Other			
Low Voltage Regulators : Input Voltage 6V or lower	XC6237A,B	1.6～6.0	1.2～5.0	1.0%	150	0.6	1.1	60	Yes	FB+Lim	GO/Discharge	105℃	SSOT-24 USPQ-4B05	73
	XC6237C	1.6～6.0	1.2～5.0	1.0%	150	0.6	1.1	60	–	FB+Lim	GO	105℃	SOT-23	73
	XC6220	1.6～6.0	0.8～5.0	1.0%	1000	8	0.2	50	Yes	FB+Lim	GO/Inrush/TSD/Discharge	85℃	USP-6C, SOT-25 SOT-89-5, SOP-8FD	84
	XC6218	1.5～6.0	0.9～4.0	2.0%	200	1	2.0	40	–	FB+Lim	–	85℃	USP-3 SSOT-24	86
	XC6217	1.6～6.0	0.8～4.0	2.0%	200	4.5	0.8	70	Yes	FB+Lim	GO/Discharge	85℃	SOT-25, SSOT-24 USP-4D, USPN-4	87
	XC6215P	1.5～6.0	0.9～5.0	2.0%	200	0.8	2.3	35	–	FB+Lim	–	85℃	USP-3	89
	XC6215B	1.5～6.0	0.9～5.0	2.0%	200	0.8	2.3	35	Yes	FB+Lim	–	85℃	SOT-25, SSOT-24 USP-4, USPN-4, USP-6B06	89
	XC6214	1.8～6.0	1.2～5.0	2.0%	500	8	1.0	40	–	FB+Lim	TSD	85℃	TO-252 SOT-89	90
	XC6206	1.8～6.0	1.2～5.0	1.0% 2.0%	250	1	1.8	35	–	FB+Lim	–	85℃	USP-6B SOT-89 ,SOT-23	92
	XC6504	1.4～6.0	1.1～5.0	1.0%	150	0.6	2.1	30	Yes	FB+Lim	CL less/Discharge	85℃	SOT-25, SSOT-24 USPN-4B02, USPQ-4B04	102
Middle Voltage Regulators : Input Voltage 18V or lower	XC6201	1.8～10.0	1.3～6.0	1.0% 2.0%	200	2	2.0	35	–	Lim	–	85℃	USP-6B SOT-89 ,SOT-25	95
	XC62FJ	1.8～10.0	1.7～6.0	2.0%	200	2	2.0	35	–	Lim	–	85℃	SOT-89	96
High Voltage Regulators : Input Voltage 36V or lower	XC6216B	2.0～28.0	2.0～12.0	1.0% 2.0%	150	5	6.5	30	Yes	FB+Lim	TSD	85℃	SOT-25, SOT-89-5 USP-6B06, USP-6C	88
	XC6216C	1.8～28.0	2.0～23.0	1.0% 2.0%	150	5	6.5	30	Yes	FB+Lim	TSD	85℃	USP-6C SOT-25 ,SOT-89-5	88
	XC6216D	2.0～28.0	1.8～12.0	1.0% 2.0%	150	5	6.5	30	–	FB+Lim	TSD	85℃	TO-252 SOT-89 ,SOT-223, SOT-23	88
	XC6408	2.0～28.0	2.0～18.0	2.0%	150	9.6	8.0	40	No	FB+Lim	TSD/VD	85℃	SOT-25 SOT-89-5 ,USP-6C	111

■ Voltage Regulator (Middle Speed)

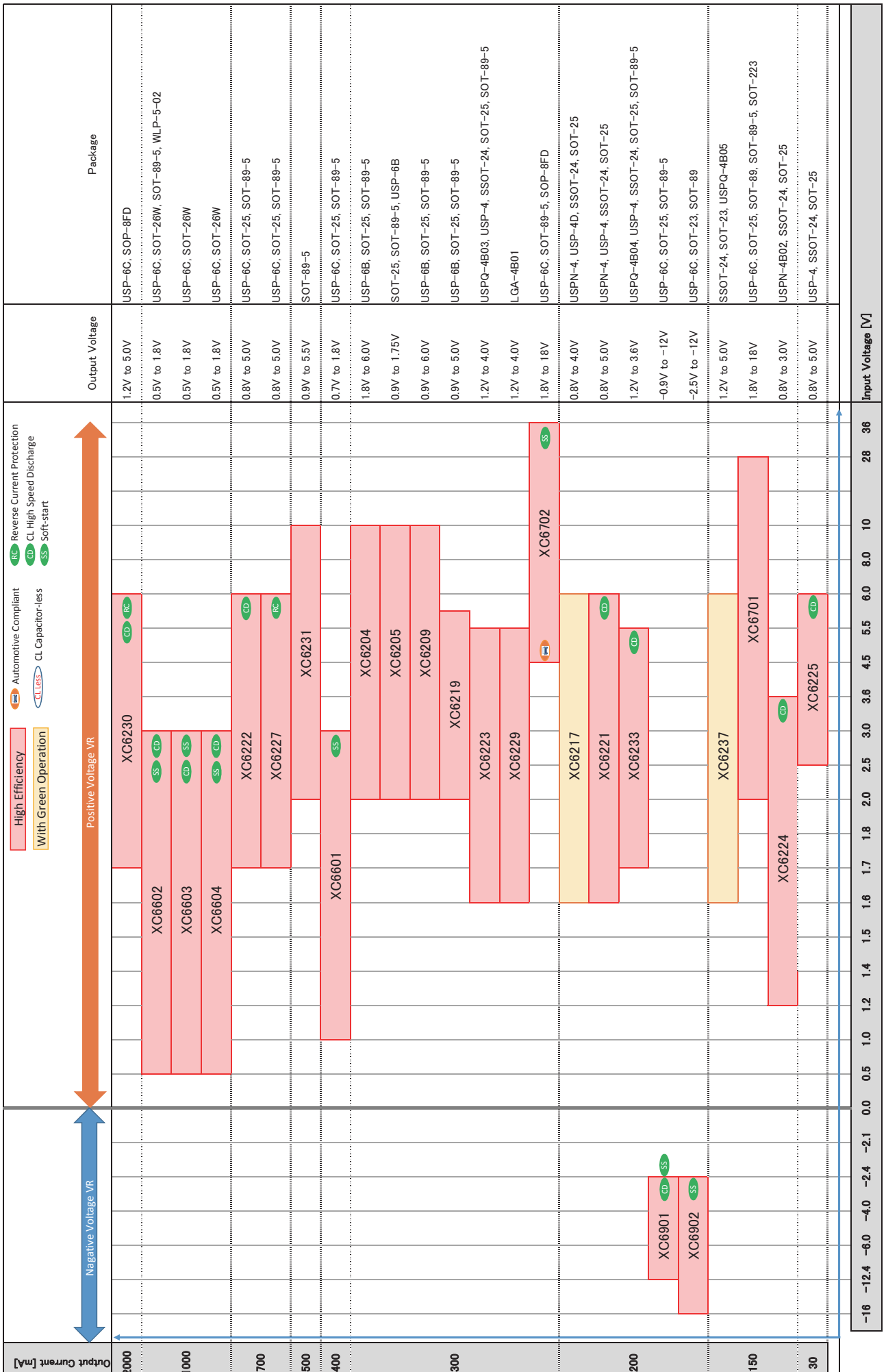


Output Voltage	Package
0.8V to 5.0V	USP-6C, SOT-25, SOT-89-5, SOP-8FD
1.2V to 5.0V	SOT-89, TO-252
0.8V to 4.0V	USPN-4, USP-4D, SSOT-24, SOT-25
1.5V to 8.0V	USP-6C, SOT-25, SOT-89-5
1.2V to 5.0V	SSOT-24, SOT-23, USPQ-4B05

■ Voltage Regulator (Middle Speed)

	Series	Vin [V]	Vout [V]	Vout Accuracy	Iout [mA]	Iss [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Ta max.	Package	Page
									CE	Current Limit	Other			
Low Voltage Regulators : Input Voltage 6V or lower	XC6237A,B	1.6～6.0	1.2～5.0	1.0%	150	0.6	1.1	60	Yes	FB+Lim	GO/Discharge	105℃	SSOT-24 USPQ-4B05	73
	XC6237C	1.6～6.0	1.2～5.0	1.0%	150	0.6	1.1	60	-	FB+Lim	GO	105℃	SOT-23	73
	XC6220	1.6～6.0	0.8～5.0	1.0%	1000	8	0.2	50	Yes	FB+Lim	GO/Inrush/TSD/Discharge	85℃	USP-6C ,SOT-25 SOT-89-5 ,SOP-8FD	84
	XC6217	1.6～6.0	0.8～4.0	2.0%	200	4.5	0.8	70	Yes	FB+Lim	GO/Discharge	85℃	SOT-25, SSOT-24 USP-4D, USPN-4	87
	XC6214	1.8～6.0	1.2～5.0	2.0%	500	8	1.0	40	-	FB+Lim	TSD	85℃	TO-252 SOT-89	90
Middle Voltage Regulators : Input Voltage 18V or lower	XC6505	1.7～10.5	1.5～8.0	1.0%	200	5.5	1.1	60	Yes	FB+Lim	TSD/Discharge	105℃	USP-6C SOT-89-5 ,SOT-25	101
High Voltage Regulators : Input Voltage 36V or lower	XC6408	2.0～28.0	2.0～18.0	2.0%	150	8	8.0	40	No	FB+Lim	TSD/VD	85℃	SOT-25 SOT-89-5 ,USP-6C	111

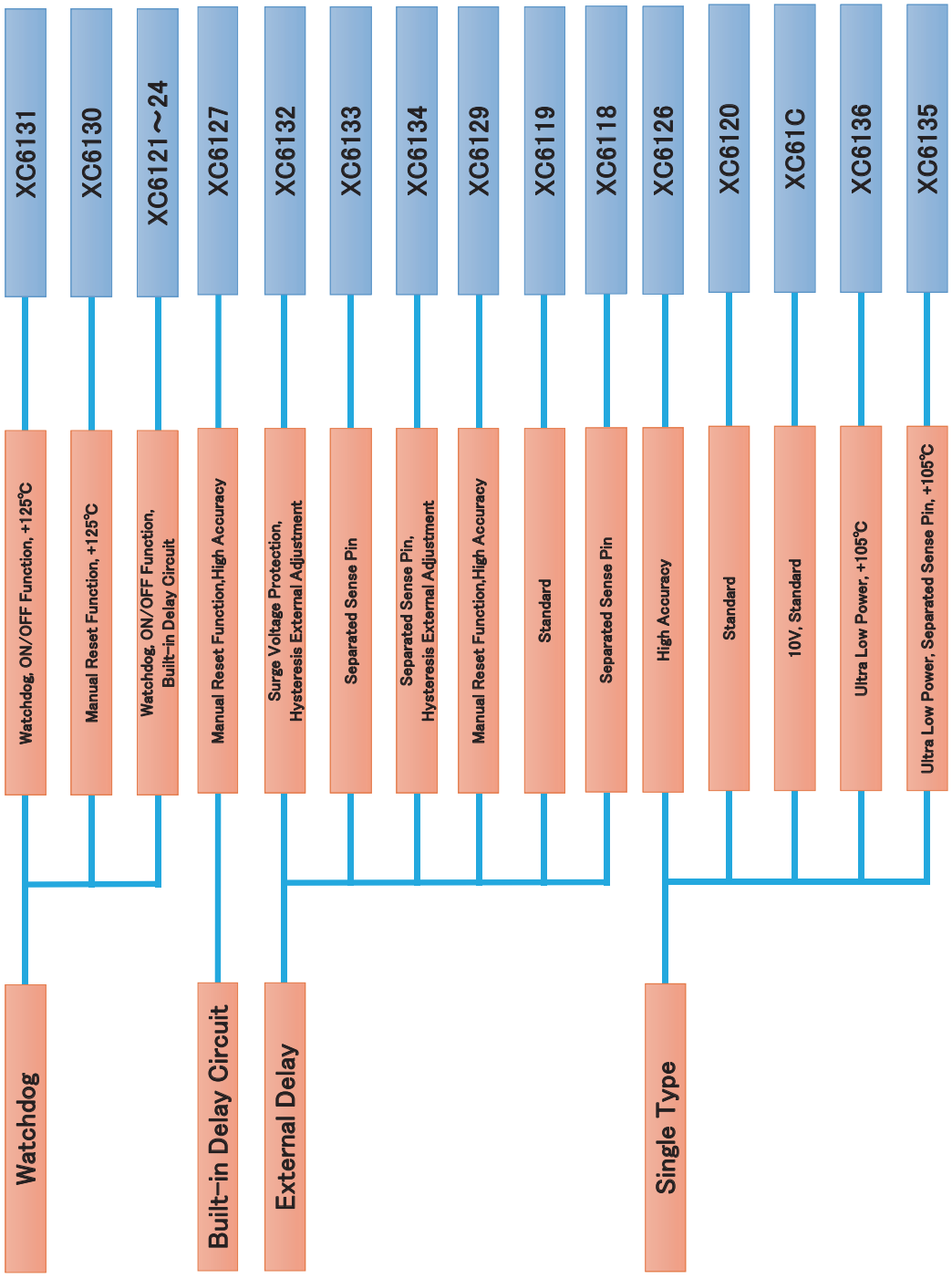
Voltage Regulator (High Speed)



Voltage Regulator (High Speed)

	Series	Vin [V]	Vout [V]	Vout Accuracy	Iout [mA]	Iss [μA]	Ron [Ω]	PSRR @1kHz [dB]	Function			Ta max.	Package	Page
									CE	Current Limit	Other			
Low Input Voltage Regulator (Vin=0.5V~3.0V)	XC6604	0.5~3.0	0.5~1.8	0.5%	1000	100	0.15	75	Yes	FB+Lim	UVLO/TSD/SoftStart/Ilim adj./Discharge	85℃	USP-6C SOT-26W	97
	XC6603	0.5~3.0	0.5~1.8	0.5%	1000	100	0.15	75	Yes	FB+Lim	UVLO/TSD/SoftStart adj./Discharge	85℃	USP-6C SOT-26W	98
	XC6602	0.5~3.0	0.5~1.8	0.5%	1000	100	0.15	75	Yes	FB+Lim	UVLO/TSD/SoftStart/Discharge	85℃	USP-6C, SOT-89-5 SOT-26W, WLP-5-02	99
Low Voltage Regulators : Input Voltage 6V or lower	XC6237A,B	1.6~6.0	1.2~5.0	1.0%	150	0.6	1.1	75	Yes	FB+Lim	GO/Inrush/Discharge	105℃	SSOT-24 USPQ-4B05	73
	XC6237C	1.6~6.0	1.2~5.0	1.0%	150	0.6	1.1	60	-	FB+Lim	GO/Inrush	105℃	SOT-23	73
	XC6233	1.7~5.5	1.2~3.6	1.0%	200	45	1.2	60	Yes	FB+Lim	Discharge/Inrush	85℃	SOT-25 ,SSOT-24 USP-4 ,USPQ-4B04	74
	XC6230	1.7~6.0	1.2~5.0	1.0%	2000	45	0.17	70	Yes	FB+Lim	Reverse/Inrush/TSD/Ilim adj./Discharge	105℃	USP-6C, SOP-8FD	76
	XC6229	1.6~5.5	1.2~4.0	1.0%	300	100	0.5	80	Yes	FB+Lim	Inrush/TSD/Discharge	85℃	LGA-4B01	77
	XC6227	1.7~6.0	0.8~5.0	1.0%	700	100	0.4	65	Yes	FB+Lim	Reverse/TSD	85℃	USP-6C SOT-25 ,SOT-89-5	78
	XC6225	2.5~6.0	0.8~5.0	2.0%	30	25	3.2	70	Yes	FB+Lim	Discharge	85℃	SOT-25 SSOT-24, USP-4	79
	XC6224	1.2~3.6	0.8~3.0	1.5%	150	33	1.4	70	Yes	FB+Lim	Discharge	85℃	SOT-25 SSOT-24, USPN-4B02	80
	XC6223	1.6~5.5	1.2~4.0	1.0%	300	100	0.7	80	Yes	FB+Lim	Inrush/TSD/Discharge	105℃	SOT-25. SSOT-24 USP-4. USPQ-4B03 SOT-89-5	81
	XC6222	1.7~6.0	0.8~5.0	1.0%	700	100	0.4	65	Yes	FB+Lim	TSD/Discharge	85℃	USP-6C SOT-25 ,SOT-89-5	82
	XC6221	1.6~6.0	0.8~5.0	1.0%	200	25	0.8	70	Yes	FB+Lim	Discharge	85℃	SOT-25. SSOT-24 USP-4. USPN-4	83
	XC6219	2.0~6.0	0.9~5.0	1.0%	300	25	1.6	70	Yes	FB+Lim	-	85℃	USP-6B SOT-25 ,SOT-89-5	85
	XC6217	1.6~6.0	0.8~4.0	1.0%	200	4.5	0.8	70	Yes	FB+Lim	GO/Discharge	85℃	SOT-25, SSOT-24 USP-4D, USPN-4	87
	XC6601	1.0~3.0	0.7~1.8	20mV	400	25	0.3	60	Yes	FB+Lim	UVLO/TSD/SoftStart/Discharge	85℃	USP-6C SOT-89-5 ,SOT-25	100
	XC6405	2.0~6.0	0.9~5.1	2.0%	500	90	3.1	70	Yes	FB+Lim	VD	85℃	SOT-25 SOT-89-5	112
	XC6404	2.0~6.0	0.9~5.1	2.0%	500	35	2.1	75	Yes	FB+Lim	VD	85℃	SOT-89-5 SOT-25, USP-6B	113
	XC6403	2.0~6.0	0.9~5.6	2.0%	300	35	2.1	75	Yes	FB+Lim	VD	85℃	SOT-25 SOT-89-5 ,USP-6B	113
Middle Voltage Regulators : Input Voltage 18V or lower	XC6231	2.0~10.0	0.9~5.5	2.0%	500	35	1.6	65	-	FB+Lim	-	85℃	SOT-89-5	75
	XC6209	2.0~10.0	0.9~6.0	2.0%	300	25	1.6	80	Yes	FB+Lim	-	85℃	USP-6B SOT-89-5, SOT-23	91
	XC6205	2.0~10.0	0.9~1.75	1.0%	300	70	1.6	70	Yes	FB+Lim	-	85℃	USP-6B SOT-25, SOT-89-5	94
	XC6204	2.0~10.0	1.8~6.0	1.0%	300	70	1.6	65	Yes	FB+Lim	-	85℃	USP-6B SOT-25, SOT-89-5	94
High Voltage Regulators : Input Voltage 36V or lower	XC6702	4.5~36.0	1.8~18.0	1.0%	300	40	4.3	65	Yes	FB+Lim	SoftStart/TSD	105℃	USP-6C SOT-89-5 ,SOP-8FD	105
	XC6701A	2.0~28.0	1.8~18.0	2.0%	150	50	6.5	50	Yes	FB+Lim	TSD	105℃	USP-6C SOT-89-5 ,SOT-25	106
	XC6701D	2.0~28.0	1.8~18.0	2.0%	150	50	6.5	50	-	FB+Lim	TSD	85℃	TO-252 SOT-223 ,SOT-89	106
Negative Voltage Regulator	XC6902	-2.4~-16.0	-2.5~-12.0	1.5%	200	100	3.9	45	-	FB+Lim	TSD	85℃	USP-6C SOT-89 ,SOT-23	107
	XC6901	-2.4~-12.4	-0.9~-12.0	1.5%	200	100	2.5	45	Yes	FB+Lim	TSD/Discharge	85℃	USP-6C SOT-89-5 ,SOT-25	108

■ Voltage Detector



■ Voltage Detector

	Series	Vin [V]	VDF [V]	Acurracy	Iss [μA]	Output		Voltage Detect						Ta max.	Package	Page
						Configuration	Logic	Separate Sense Pin	Detect Delay time	Release Delay time	Hys	Manual Reset	Unstable operation prevention			
Low Voltage Voltage Detectors : Input Voltage 6V or lower	XC6136	1.1～6.0	1.2～5.0	1.0%	0.088	CMOS N-ch	Active "H" Active "L"	-	-	-	VDFx0.1% VDFx5%	-	CMOS Only	105℃	USPQ-4B05 SSOT-24 SOT-25	56
	XC6135	1.1～6.0	0.5～5.0	1.0%	0.044	CMOS N-ch	Active "H" Active "L"	Yes	-	-	VDFx0.1% VDFx5%	-	CMOS Only	105℃	USPQ-4B05 SSOT-24 SOT-25	57
	XC6134	1.6～6.0	0.8～5.0	1.2%	1.32	CMOS N-ch	Active "H" Active "L"	Yes	Adj.	Adj.	Adj.	Yes	-	125℃	SOT-26 USP-6C	58
	XC6133	1.6～6.0	1.0～5.0	1.2%	1.32	CMOS N-ch	Active "H" Active "L"	Yes	Adj.	Adj.	VDFx5%	Yes	-	125℃	SOT-26 USP-6C	59
	XC6132	1.6～6.0	0.8～2.0	1.2%	1.32	CMOS N-ch	Active "H" Active "L"	Yes	Adj.	Adj.	Adj.	Yes	-	125℃	SOT-26 USP-6C	60
	XC6131	1.5～6.0	1.6～5.0	1.0%	2.5@EN=L 9.8@EN=H	N-ch	Active "L"	-	-	Adj.	VDFx5%	-	-	125℃	SOT-26 DFN1515-6A	61
	XC6130	1.5～6.0	1.6～5.0	1.0%	9.8	N-ch	Active "L"	-	-	Adj.	VDFx5%	Yes	-	125℃	SOT-26 DFN1515-6A	61
	XC6129	1.3～6.0	1.5～5.5	0.8%	0.58	CMOS N-ch	Active "H" Active "L"	-	Adj.	Adj.	VDFx5%	Yes	CMOS Only	85℃	SSOT-24 USPN-4 USPQ-4B05	62
	XC6127	0.7～6.0	1.5～5.5	0.8%	0.7	CMOS N-ch	Active "H" Active "L"	-	-	50ms ~800ms	VDFx5%	Yes	-	85℃	SOT-25 SSOT-24 USPN-4	63
	XC6126	0.7～6.0	1.5～5.5	0.8%	0.7	CMOS N-ch	Active "L"	-	-	-	VDFx5%	-	-	85℃	SSOT-24 USPN-4B02	64
	XC6121-XC6124	1.0～6.0	1.6～5.0	2.0%	10	N-ch	Active "L"	-	-	3.13ms ~400ms	VDFx5%	-	-	85℃	SOT-25 USP-6C	65
	XC6120	0.7～6.0	1.0～5.0	2.0%	0.6	CMOS N-ch	Active "L"	-	-	-	VDFx5%	-	-	85℃	SSOT-24 USP-3	66
	XC6119	0.7～6.0	0.8～5.0	2.0%	0.9	CMOS N-ch	Active "L"	-	-	Adj.	VDFx5%	-	-	85℃	SSOT-24 USPN-4	67
	XC6118	1.0～6.0	0.8～5.0	2.0%	0.8	CMOS N-ch	Active "L"	Yes	-	Adj.	VDFx1% VDFx5%	-	CMOS Only	85℃	SOT-25 USP-4	68
	XD6133 (AEC-Q100)	1.6～6.0	1.0～5.0	1.2%	1.32	CMOS N-ch	Active "H" Active "L"	Yes	Adj.	Adj.	VDFx5%	Yes	-	125℃	SOT-26 USP-6C	140
	XD6132 (AEC-Q100)	1.6～6.0	0.8～2.0	1.2%	1.32	CMOS N-ch	Active "H" Active "L"	Yes	Adj.	Adj.	Adj.	Yes	-	125℃	SOT-26 USP-6C	141
	XD6131 (AEC-Q100)	1.5～6.0	1.6～5.0	1.0%	2.5@EN=L 9.8@EN=H	N-ch	Active "L"	-	-	Adj.	VDFx5%	-	-	125℃	SOT-26	142
	XD6130 (AEC-Q100)	1.5～6.0	1.6～5.0	1.0%	9.8	N-ch	Active "L"	-	-	Adj.	VDFx5%	Yes	-	125℃	SOT-26	142
	XD6121-XD6124 (AEC-Q100)	1.0～6.0	1.6～5.0	2.0%	10	N-ch	Active "L"	-	-	3.13ms ~400ms	VDFx5%	-	-	85℃	SOT-25	143
Midddle Voltage Voltage Detectors :Input Voltage 18V or lower	XC61H	0.7～10.0	1.6～6.0	2.0%	1	CMOS N-ch	Active "L"	-	-	1ms ~400ms	VDFx5%	-	-	80℃	SOT-23	69
	XC61G	0.7～10.0	0.8～6.0	2.0%	0.7	CMOS N-ch	Active "L"	-	-	-	VDFx5%	-	-	85℃	USP-3	70
	XC61F	0.7～10.0	1.6～6.0	2.0%	1	CMOS N-ch	Active "L"	-	-	1ms ~400ms	VDFx5%	-	-	80℃	SOT-23 SOT-89	69
	XC61C	0.7～10.0	0.8～6.0	1.0%	0.7	CMOS N-ch	Active "L"	-	-	-	VDFx5%	-	-	85℃	SOT-23 SOT-89 SSOT-24	70

XCL225/XCL226 Series

0.5A Inductor Built-in Step-down "micro DC/DC" Converter

RoHS

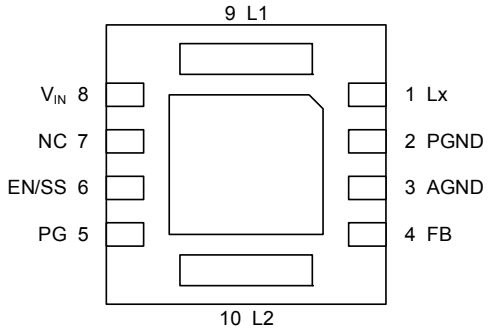
General Description

The XCL225/XCL226 series are 18V operation synchronous step-down DC/DC converter ICs with a built-in high-side / low-side driver transistor. The XCL225/XCL226 series has operating voltage range of 3.0V～18.0V and it can support 0.5A as an output current with high-efficiency. Compatible with Low ESR capacitors such as ceramic capacitors for the load capacitor (C_L).
0.75V reference voltage source is incorporated in the IC, and the output voltage can be set to a value from 1.0V to 15.0V using external resistors (R_{FB1}, R_{FB2}).
1.2MHz can be selected for the switching frequency. In PWM/PFM automatic switchover control, IC can change the control method between PWM and PFM based on the output current requirement and as a result IC can achieve high efficiency over the full load range.
XCL225/XCL226 has a fixed internal soft start time which is 1.0ms (TYP.), additionally the time can be extended by using an external resistor and capacitor.

Features

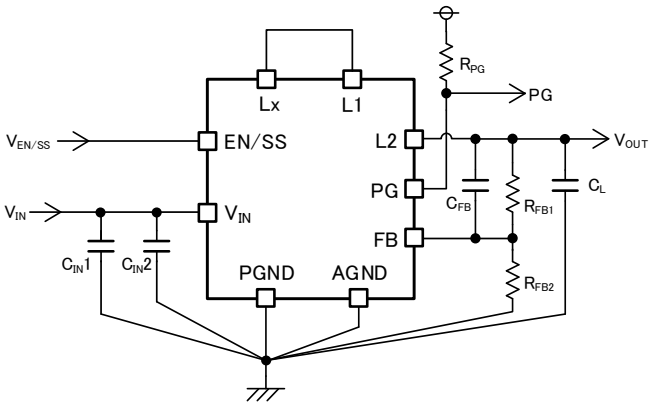
Input Voltage Range: 3～18V (Absolute Max. Rating: 20V)
FB Voltage: 0.75V (±1.5%)
Oscillation Frequency: 1.2MHz
Output Current: 0.5A
Control Methods: PWM control
PWM/PFM Automatic
Efficiency 85%@12V→5V, 1mA
Soft-start Time: Adjustable by RC
Protection Circuits: Over Current Protection
Automatic Recovery
(XCL225B/XCL226B)
Integral Latch Method
(XCL225A/XCL226A)
Thermal Shutdown
Package: DFN3030-10B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

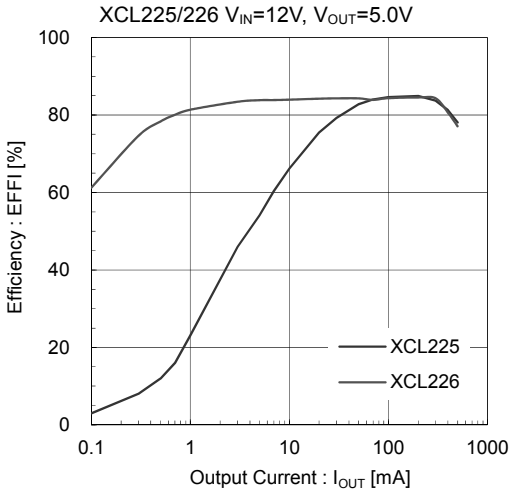


(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XCL225①②③④⑤⑥ PWM control
XCL226①②③④⑤⑥ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to Selection Guide
		B	
②③	FB Voltage	0K	FB Voltage 0.75V Voltage can be adjusted in 1V to 15V
④	Oscillation Frequency	1	1.2MHz
⑤⑥	Package (Order Unit)	H2	DFN3030-10B (3,000pcs/Reel)

●Selection Guide

TYPE	Chip Enable	UVLO	Thermal Shutdown	Soft Start	Power-Good	Current Limitter	Automatic Recovery (Current Limitter)	Latch Protection (Current Limitter)
A	YES	YES	YES	YES	YES	YES	NO	YES (*2)
B	YES	YES	YES	YES	YES	YES	YES	NO

(*2) The over-current protection latch is an integral latch type.

XCL223/XCL224 Series

0.4A/0.7A Inductor Built-in Step-Down "micro DC/DC" Converters

RoHS Halogen Antimony FREE

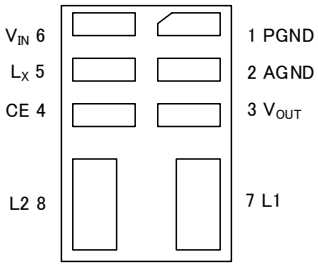
General Description

The XCL223/XCL224 series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.25mm×1.5mm, H=0.75mmMAX).
A stable power supply is configured using only two capacitors connected externally.
An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring.
A wide operating voltage range of from 2.5V to 5.5V enables support for applications that require an internally fixed output voltage (0.8V to 3.6V). The accuracy of the output voltage is ± 2.0% and the voltage is adjustable internally with 0.05V step.
The XCL223/XCL224 series uses synchronous rectification and the operating frequency is 3.0MHz. The XCL223/XCL224 series uses HiSAT-COT(*) synchronous rectification. HiSAT-COT+PWM control (XCL223) or HiSAT-COT+automatic PWM/PFM switching control (XCL224) can be selected. The maximum load current can be selected either 400mA or 700mA.
The series have a high speed soft-start (0.3ms TYP.) for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when the input voltage becomes 2.0V or lower. When CE is "Low", the integrated C_L discharge function discharges the electric charge at the output capacitor C_L via the internal discharge switch located between the L_X and PGND pins. The power consumption will be less than 1.0μA.
(*) HiSAT-COT is an original Torex term for High Speed Transient Response.

Features

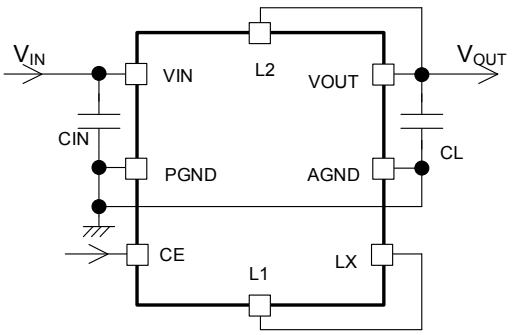
Input Voltage: 2.5V～5.5V
(Absolute Max. Rating: 6.2V)
Output Voltage: 0.8V～3.6V (±2.0%)
Output Current: 700mA (XCL223A/XCL224A)
400mA (XCL223B/XCL224B)
Quiescent Current: 25μA (f_{OSC}=3.0MHz)
Oscillation Frequency: 3.0MHz
Control Methods: HiSAT-COT Control
100% Duty Cycle
PWM Control (XCL223)
PWM/PFM Automatic Switching Control (XCL224)
Circuit Protection: Thermal Shutdown
Current Limit Circuit (Drop)
Short Circuit Protection
Functions: Soft-start
UVLO
C_L Discharge
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+105℃
Package: USP-8B04
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



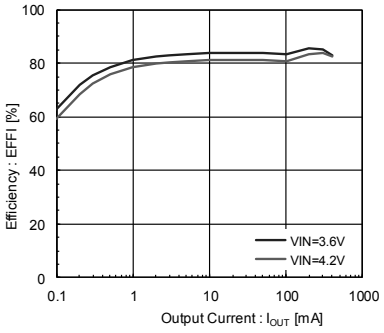
USP-8B04
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XCL224B213DR(V_{OUT}=2.1V)



Ordering Information

XCL223①②③④⑤⑥-⑦ PWM control
XCL224①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Output Current : 700mA
		B	Output Current : 400mA
②③	Output Voltage	08～36	Output Voltage options e.g.)1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V Increments: 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L,0.95=M
④	Oscillation Frequency	3	3.0MHz
⑤⑥-⑦(*1)	Package (Order Unit)	D2-G	USP-8B04 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	C_L AUTO-DISCHARGE	LATCH or SHORT PROTECTION	UVLO	CHIP ENABLE	CURRENT LIMIT	SOFT-START	THERMAL SHUTDOWN
B (400mA)	Fixed	Yes	Yes	Yes	Yes	Yes	Fixed	Yes
A (700mA)	Fixed	Yes	Yes	Yes	Yes	Yes	Fixed	Yes

*GreenOperation-compatible

XCL221/XCL222 Series

0.5A Inductor Built-in Step-Down "micro DC/DC" Converters

RoHS Halogen Antimony FREE

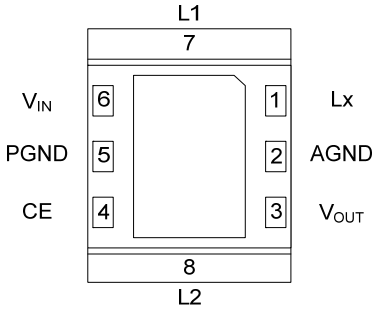
General Description

The XCL221/XCL222 series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.0mm×2.5mm, h=1.0mm). An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring. A wide operating voltage range of 2.5V to 5.5V enables support for applications that require an internally fixed output voltage (0.8V to 3.6V). The XCL221/XCL222 series uses synchronous rectification at an operating frequency of 1.2MHz. The XCL221/XCL222 series uses HiSAT-COT(*) synchronous rectification.
HiSAT-COT+PWM control (XCL221) or HiSAT-COT+automatic PWM/PFM switching control (XCL222) can be selected.
The series have a high speed soft-start as fast as 0.25ms (TYP.) in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.0V or lower. When CE=Low, the integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the L_X and PGND pins. The power consumption will be less than 1.0μA.
(*) HiSAT-COT is an original Torex term for High Speed Transient Response.

Features

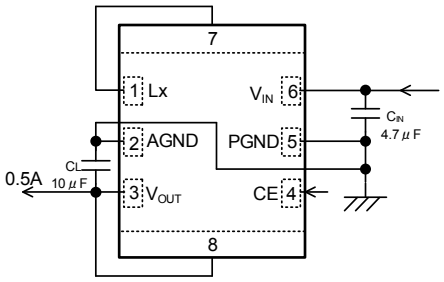
Input Voltage: 2.5V～5.5V
Output Voltage: 0.8V～3.6V (±2.0%)
Efficiency: 93% (V_{IN}=5.0V, V_{OUT}=3.3V/200mA)
Output Current: 500mA
Oscillation Frequency: 1.2MHz
Control Methods: HiSAT-COT Control
100% Duty Cycle
PWM Control (XCL221)
PWM/PFM Switching Control (XCL222)
Circuit Protection: Thermal Shutdown
Current Limit Circuit (Drop)
Short Circuit Protection (Latch)
Functions: Soft-start Circuit Built-in
UVLO
C_L Discharge
Output Capacitor: Low ESR Ceramic Capacitor
Operating Ambient Temperature: -40℃～+105℃
Package: CL-2025-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



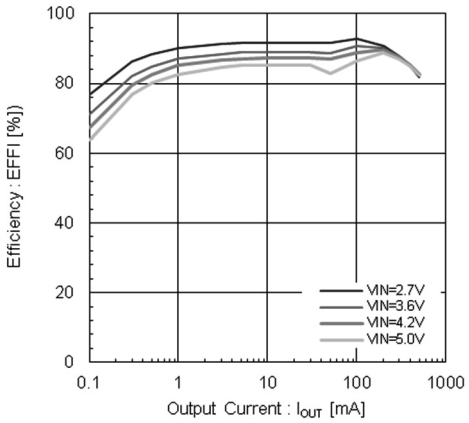
CL-2025-02
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XCL222B181ER-G (V_{OUT}=1.8V)



Ordering Information

XCL221①②③④⑤⑥-⑦ PWM
XCL222①②③④⑤⑥-⑦ PWM/PFM Automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	B	Output Voltage (Fixed) C_L Auto Discharge Latch, Short Protection UVLO Chip Enable Current Limit Soft-start Thermal Shutdown
②③	Output Voltage	08～36	Output Voltage options e.g.)1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V Increments: 0.05=A,0.15=B,0.25=C,0.35=D,0.45=E,0.55=F,0.65=H, 0.75=K,0.85=L,0.95=M
④	Oscillation Frequency	1	1.2MHz
⑤⑥-⑦(*1)	Package (Order Unit)	ER-G	CL-2025-02 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XCL219/XCL220 Series

1.0A Inductor Built-in Step-Down "micro DC/DC" Converters

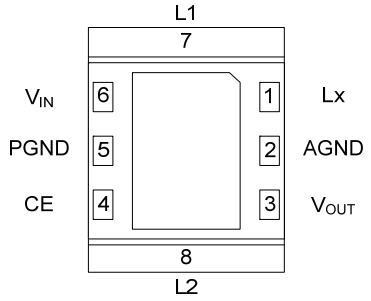
General Description

The XCL219/XCL220 series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.0mm×2.5mm, h=1.0mm). An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring. A wide operating voltage range of 2.5V to 5.5V enables support for applications that require an internally fixed output voltage (0.8V to 3.6V). The XCL219/XCL220 series uses synchronous rectification at an operating frequency of 3.0MHz. The XCL219/XCL220 series uses HiSAT-COT(*) synchronous rectification.
HiSAT-COT+PWM control (XCL219) or HiSAT-COT+automatic PWM/PFM switching control (XCL220) can be selected.
The series have a high speed soft-start as fast as 0.3ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.0V or lower. When CE=Low, the integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the L_X and V_{SS} pins. The power consumption will be less than 1.0μA.
(*) HiSAT-COT is an original Torex term for High Speed Transient Response.

Features

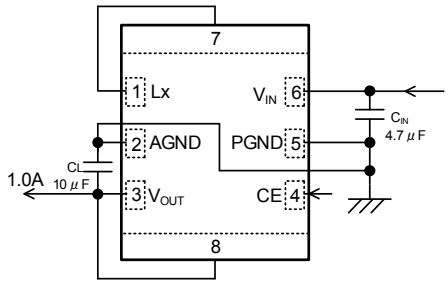
Input Voltage: 2.5V～5.5V (Absolute Max. Rating: 6.2V)
Output Voltage: 0.8V～3.6V
Oscillation Frequency: 3MHz
Output Current: 1.0A
Efficiency: 93% (V_{IN}=5.0V, V_{OUT}=3.3V/300mA)
Control Methods: HiSAT-COT
100% Duty Cycle
PWM (XCL219)
PWM/PFM (XCL220)
Circuit Protection: Thermal Shutdown
Current Limit Circuit (Drop)
Short Circuit Protection
Functions: Soft-start Circuit Built-in
UVLO
C_L Discharge
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+105℃
Package: CL-2025-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



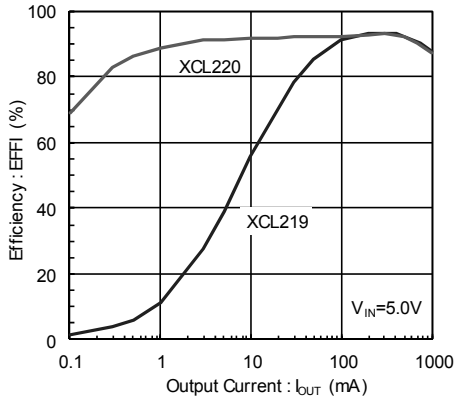
CL-2025-02
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XCL219/XCL220 (V_{OUT}=3.3V)



Ordering Information

XCL219①②③④⑤⑥-⑦ PWM control
XCL220①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	B	Output Voltage (Fixed) C_L Auto Discharge Latch or Short Protection UVLO Chip Enable Current Limit Soft-start (Fixed) Thernal Shutdown
②③	Output Voltage	08～36	Output Voltage options e.g.)1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V Increments: 0.05=A,0.15=B,0.25=C,0.35=D,0.45=E,0.55=F,0.65=H, 0.75=K,0.85=L,0.95=M
④	Oscillation Frequency	3	3.0MHz
⑤⑥-⑦(*1)	Package (Order Unit)	FR-G	CL-2025-02 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

*GreenOperation-compatible

XCL213/XCL214 Series

1.5A Inductor Built-in Step-Down "micro DC/DC" Converters

RoHS

General Description

The XCL213/XCL214 series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.5mm×3.2mm, h=1.0mm). A 1.5 A (max.) power circuit can be created by simply adding two ceramic capacitors to the external components. Because the coil is incorporated in the IC, the board layout is easier to design and malfunctioning and noise caused by component placement and wiring can be minimized. A wide operating voltage range of 2.7V to 5.5V enables support for applications that require an internally fixed output voltage (0.8V to 3.6V). The XCL213/XCL214 series uses synchronous rectification at an operating frequency of 3MHz. The operation mode is "HiSAT-COT(*) control", which has excellent transient response characteristics. "PWM control" or "PWM/PFM auto switching control" can be selected as needed for the application. "PWM control" enables reduction of the output ripple voltage. "PWM/PFM auto switching control" achieves high efficiency across the entire load range, from light loads to heavy loads.

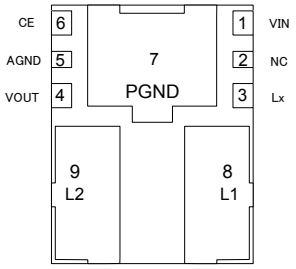
The series have a high speed soft-start as fast as 0.3ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.0V(TYP.) or lower. The integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the L_X and V_{SS} pins.

(*) HiSAT-COT is an original Torex term for High Speed Transient Response.

Features

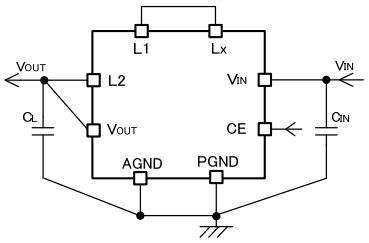
Input Voltage:	2.7V～5.5V (Absolute Max. Rating: 6.2V)
Output Voltage:	0.8V～3.6V
Oscillation Frequency:	3MHz
Output Current:	1.5A
Efficiency:	92% (V_{IN}=5.0V, V_{OUT}=3.3V, 500mA)
Control Methods:	HiSAT-COT Control 100% Duty cycle HiSAT-COT+PWM (XCL213) HiSAT-COT+PWM/PFM (XCL214)
Circuit Protection:	Thermal Shutdown Current Limit Circuit (Drop) Short Circuit Protection
Functions:	Soft-Start Circuit Built-In UVLO C_L Discharge
Output Capacitor:	Low ESR Ceramic Capacitor
Operating Ambient Temperature:	-40℃ ~ +105℃
Package:	USP-9B01
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



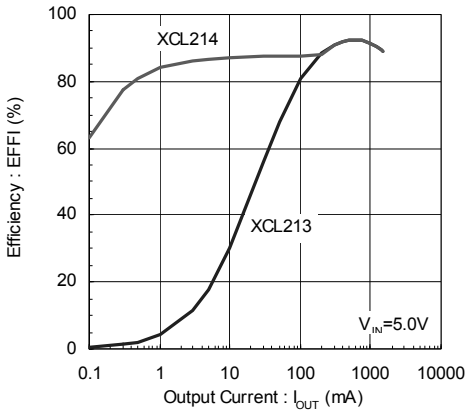
USP-9B01
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XCL213/XCL214 (V_{OUT}=3.3V)



Ordering Information

XCL213①②③④⑤⑥ Fixed PWM control
XCL214①②③④⑤⑥ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	B	Refer to Selection Guide
		E	Refer to Selection Guide
②③	Output Voltage	08～36	Output Voltage options Ex) 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V Increments: 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Oscillation Frequency	3	3MHz
⑤⑥(*1)	Package (Order Unit)	DR	USP-9B01(*2) (3,000pcs/Reel)

(*1) Halogen free and EU RoHS compliant.
(*2) The USP-9B01 reels are shipped in a moisture-proof packing.

●Selection Guide

TYPE	OUTPUTT VOLTAGE	C_L AUTO-DISCHARGE	LATCH or SHORT PROTECTION	UVLO	CE	CURRENT LIMIT	SOFT-START Min.	THERMAL SHUTDOWN
B	Fixed	Yes	Yes	Yes	Yes	Yes	0.1ms	Yes
E	Fixed	Yes	Yes	Yes	Yes	Yes	0.2ms	Yes

XCL211/XCL212 Series

2.0A Inductor Built-in Step-Down "micro DC/DC" Converters

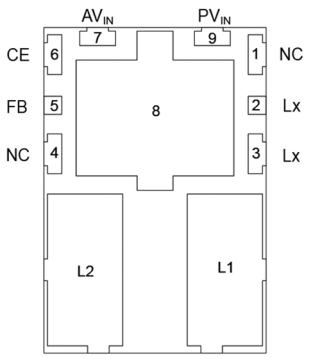
General Description

The XCL211/XCL212series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package (3.1mm×4.7mm, h=1.3mm).
An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring.
A wide operating voltage range of 2.7V to 6.0V enables support for applications that require an externally set output voltage can be selected. The XCL211/XCL212 series uses synchronous rectification at an operating frequency of 2.4MHz. PWM control (XCL211) or automatic PWM/PFM switching control (XCL212) can be selected. The XCL211 series has a fixed frequency, enabling the suppression of output ripple. The XCL212 series achieves high efficiency while holding down output ripple across the full range of loads, from light to heavy, enabling the extension of battery operation time.
The series have a high speed soft-start as fast as 1ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.4V or lower. It's suitable for large-current application due to limit current is configured 4.0A in typical. The integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the LX and VSS pins. Due to C_L discharge function, malfunction on LX is prevented when Stand-by mode.

Features

Package Size: 3.1mm×4.7mm, h=1.3mm
Input Voltage: 2.7V～6.0V
(Absolute Max. Ratings: 7.0V)
Output Voltage: 0.9V～V_{IN} (FB Voltage=0.8V±2%)
High Efficiency: 94% (V_{IN}=5.0V, V_{OUT}=3.3V)
Output Current: 2.0A
Oscillation Frequency: 2.4MHz (±15%)
Max. Duty Cycle: 100%
Control Methods: PWM (XCL211)
PWM/PFM (XCL212)
Functions: Current Limit Circuit (automatic return)
Soft-start Circuit Built-in
C_L Discharge
UVLO
Output Capacitor: Low ESR Ceramic Capacitor
Operating Ambient Temperature: -40℃~ +85℃
Package: USP-11B01
Environmentally Friendly: EU RoHS Compliant, Pb Free

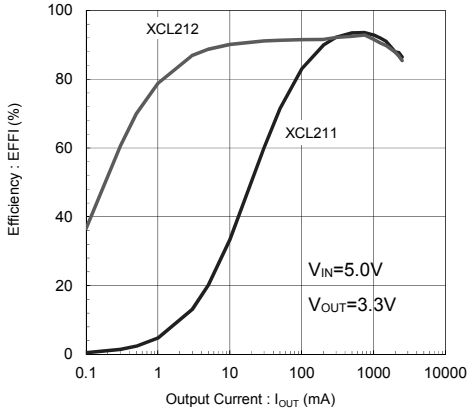
Pin Configuration



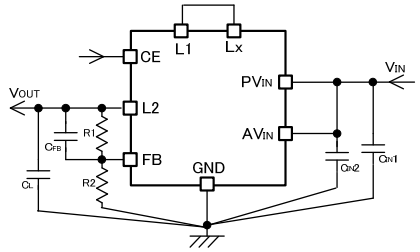
USP-11B01
(BOTTOM VIEW)

Typical Performance Characteristics

XCL211B082DR/XCL212B082DR



Typical Application Circuit



Ordering Information

XCL211①②③④⑤⑥ Fixed PWM
XCL212①②③④⑤⑥ PWM/PFM Auto Switching

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	B	Fixed Soft-start Chip Enable Current Limiter Tharmal Shutdown UVLO C_L Auto Discharge
②③	Reference Voltage	08	Reference Voltage is fixed at 0.8V
④	Oscillation Frequency	2	2.4MHz
⑤⑥(*1)	Package (Order Unit)	DR	USP-11B01 (1,000pcs/Reel)

(*1) Halogen free and EU RoHS compliant.

*GreenOperation-compatible

XCL210 Series

50mA/200mA Inductor Built-in Step-Down "micro DC/DC" Converters

RoHS
Halogen Antimony FREE

General Description

The XCL210 series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.0mm×2.5mm, h=1.0mm). An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring. A wide operating voltage range of 2.0V to 6.0V enables support for applications that require an internally fixed output voltage from 1.0V to 4.0V (±2.0%, Type A～D), 0.6V～0.95V (Type F, H) in increments of 0.05V.

During stand-by, all circuits are shutdown to reduce currentconsumption to as low as 0.1μA or less.

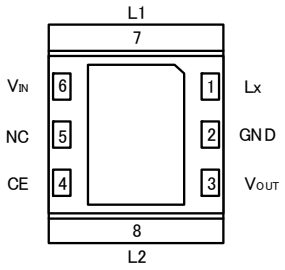
With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage becomes UVLO detect Voltage or lower.

The XCL210 integrate C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the Lx and V_{SS} pins. When the devices enter stand-by mode, output voltage quickly returns to the V_{SS} level as a result of this function.

Features

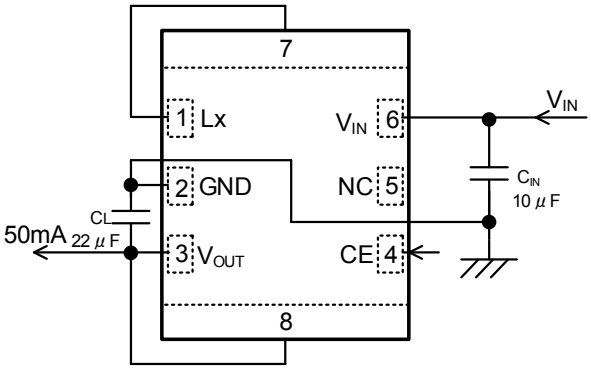
Input Voltage: 2.0V～6.0V
(Absolute Max. Rating: 7.0V)
Output Voltage: 1.0V～4.0V
(±2.0%, Type A, B, C, D)
0.6V～0.95V (±20mV Type F, H)
High Efficiency: 93% (V_{IN}=3.6V, V_{OUT}=3.0V/100μA)
Output Current: 200mA (Type A, C)
50mA (Type B, D, F, H)
Quiescent Current: 0.5μA
Control Methods: PFM control
Functions: UVLO
Short Circuit Protection
C_L Discharge (Type C, D, H)
Capacitor: Low ESR Ceramic Capacitor
Operating Ambient Temperature: -40℃～+85℃
Package: CL-2025-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



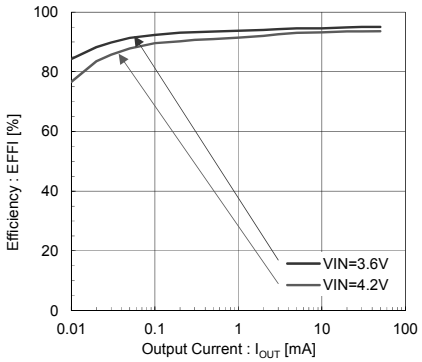
CL-2025-02
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XCL210B301GR-G(V_{OUT}=3.0V)



Ordering Information

XCL210①②③④⑤⑥-⑦ PFM control: For Type A, B, C, F, H

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Product Type	A	I_{OUT}=200mA , Without C_L Auto Discharge
		B	I_{OUT}=50mA Without C_L Auto Discharge
		C	I_{OUT}=200mA , With C_L Auto Discharge
		D	I_{OUT}=50mA, With C_L Auto Discharge
		F	I_{OUT}=50mA , Without C_L Auto Discharge
		H	I_{OUT}=50mA , With C_L Auto Discharge
②③	Output Voltage	10～40 06～0M (for Type F, H only)	Output voltage options e.g.) 1.2V → ② = 1 ③ = 2 1.25V→ ② = 1 ③ = C 0.05V increments : 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Fixed number	1	Fixed number
⑤⑥-⑦(*1)	Package (Order Unit)	GR-G	CL-2025-02 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XCL208/XCL209 Series

400mA Inductor Built-in Step-Down “micro DC/DC” Converters

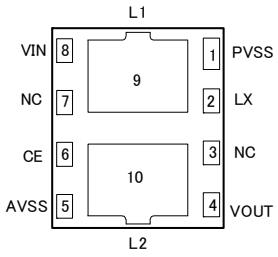
General Description

The XCL208/XCL209 series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.5mm×2.15mm, h=1.05mm). A stable power supply with an output current of 400mA is configured using only two capacitors connected externally.
An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring.
A wide operating voltage range of 1.8V (2.0V) to 6.0V enables support for applications that require an alkaline battery (2-cell) or AC adapter (5V) power supply. An internally fixed output voltage (0.8V to 4.0V) or an externally set output voltage can be selected.
The XCL208/XCL209 series uses synchronous rectification at an operating frequency of 3MHz. PWM control (XCL208) or automatic PWM/PFM switching control (XCL209) can be selected. The XCL208 series has a fixed frequency, enabling the suppression of output ripple. The XCL209 series achieves high efficiency while holding down output ripple across the full range of loads, from light to heavy, enabling the extension of battery operation time.
Soft start and on/off functions with C_L discharge are provided, and the IC can be put in the standby state by inputting a Low level signal into the CE pin.

Features

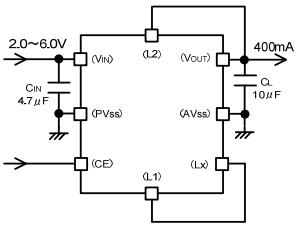
Input Voltage: 1.8V～6.0V (Type F)
(Absolute Max. Rating: 6.5V)
2.0V～6.0V (Types A/B)
(Absolute Max. Rating: 6.5V)
Output Voltage: 0.8V～4.0V (±2.0%) (Fixed)
High Efficiency : 90% (V_{IN}=4.2V, V_{OUT}=3.3V)
Output Current: 400mA
Oscillation Frequency: 3MHz (±15%)
CE Functions: Active High
Soft-start
C_L Auto Discharge
Protection Circuits: Current Limiter Built-in
(Constant Current & Latching)
Control Methods: PWM (XCL208)
PWM/PFM Auto (XCL209)
Operating Ambient Temperature: -40℃～+85℃
Package: USP-10B03
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

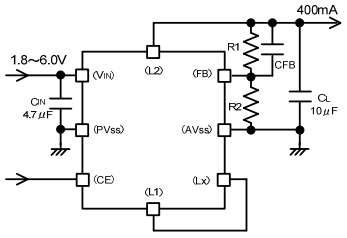


USP-10B03
(BOTTOM VIEW)

Typical Application Circuit



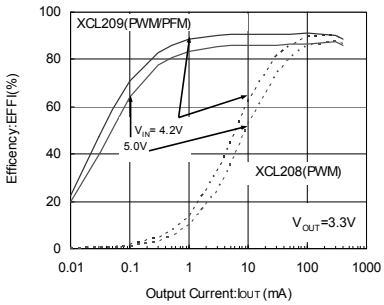
XCL208A / XCL208B
/ XCL209A / XCL209B Type



XCL208F / XCL209F Type

Typical Performance Characteristics

XCL208x333DR/XCL209x333DR



Ordering Information

XCL208①②③④⑤⑥: Fixed PWM control
XCL209①②③④⑤⑥: PWM / PFM automatic switching control

DESIGNATOR	ITEM		SYMBOL	DESCRIPTION
①	Functions selection	Fixed Output Voltage	A	V_{IN}≧2.0V, No C_L auto discharge, Standard soft-start
			B	V_{IN}≧2.0V, C_L auto discharge, High speed soft-start
		Output Voltage External Setting	F	V_{IN}≧1.8V, C_L auto discharge, High speed soft-start
②③	Fixed Output Voltage		0～9 A～M	Output voltage options e.g. 2.8V → ②=2 ③=8 0.05V increments : e.g. 2.85V→ ②=2 ③=L 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
	Output Voltage External Setting		08	FB=0.8V
④	Oscillation Frequency		3	3MHz
⑤⑥ (*1)	Package (Order Unit)		DR	USP-10B03 (3,000pcs/Reel)

(*1) Halogen free and EU RoHS compliant.
(*2) When other output voltages (semi-custom) are needed, please contact your local Torex sales office for more information. Output voltage range is 0.8~4.0V.

*GreenOperation-compatible

XCL102/XCL103 Series

Inductor Built-in Step-Up "micro DC/DC" Converters

RoHS Halogen Antimony FREE

General Description

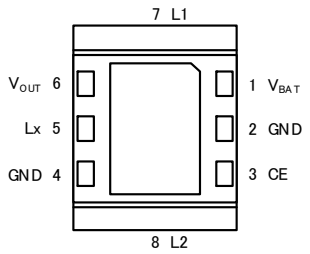
The XCL102/XCL103 series is a synchronous step-up micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.0mm×2.5mm, h=1.0mm). A stable step-up power supply is configured using only two capacitors connected externally. An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring. A wide operating voltage range of 0.9V to 6.0V enables support for applications that require an internally fixed output voltage (2.2V to 5.5V). PWM control (XCL102) or automatic PWM/PFM switching control (XCL103) can be selected.

During the devices enter stand-by mode, XCL102D/XCL103D types prevent the application malfunction by CL Discharge Function which can quickly discharge the electric charge at the output capacitor (C_L). XCL102/XCL103E types is able to drive Real Time Clock etc.

Features

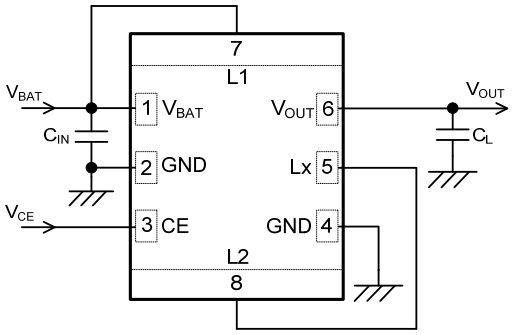
Input Voltage Range: 0.65V～6.0V (Absolute Max. Rating: 7.0V)
Fixed Output Voltage: 2.2V～5.5V (0.1V increments)
Oscillation Frequency: 3.0MHz (±20%)
Input Current: 0.8A
Output Current: 500mA @V_{OUT}=5.0V, V_{BAT}=3.3V (TYP.)
350mA @V_{OUT}=3.3V, V_{BAT} =1.8V (TYP.)
Control Mode Selection: PWM (XCL102 Series) or
Auto PWM/PFM (XCL103 Series)
Load Transient Response: 100mV@V_{OUT}=3.3V,V_{BAT}=1.8V,I_{OUT}=1mA→200mA
Protection Circuits: Over-current limit (Integral latch method)
Output short-circuit protection
Functions: Soft-start
Load Disconnection Function (Type D)
CL Auto Discharge Function (Type D)
Bypass Switch Function (Type E)
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+85℃
Package: CL-2025-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



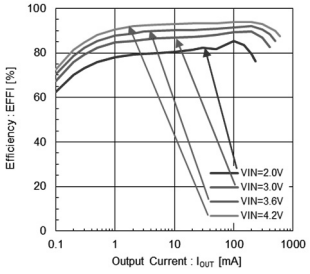
CL-2025-02
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Efficiency vs. Output Current
XCL103D503CR-G/XCL103E503CR-G



Ordering Information

XCL102①②③④⑤⑥-⑦ PWM control
XCL103①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	D	Refer to Selection Guide
		E	
②③	Output Voltage	22～55	Output Voltage options e.g.)3.3V → ②=3, ③=3 5.0V → ②=5, ③=0
④	Oscillation Frequency	3	3.0MHz
⑤⑥-⑦ (*1)	Package (Order Unit)	CR-G	CL-2025-02 (3,000pcs/Reel)

(*1) The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	CHIP ENABLE	SOFT-START	C_L AUTO-DISCHARGE	BYPASS SWITCH	LOAD DISCONNECTION	CURRENT LIMIT (WITH INTEGRAL LATCH)	SHORT PROTECTION WITH LATCH
D	Fixed	Yes	Fixed	Yes	No	Yes	Yes	Yes
E	Fixed	Yes	Fixed	No	Yes	No	Yes	Yes

XCL101 Series

100mA Inductor Built-in Step-Up “micro DC/DC” Converters

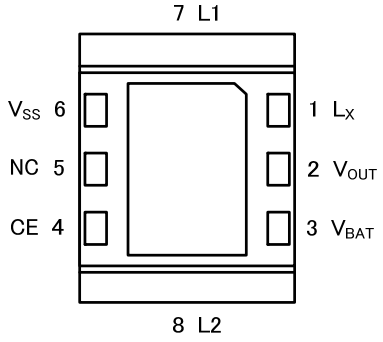
General Description

The XCL101 series is a synchronous step-up micro DC/DC converter which integrates an inductor and a control IC in one tiny package (2.5mm×2.0mm, h=1.00mm). A stable power supply with a configured using only two capacitors connected externally. An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring. A wide operating voltage range of 0.9V to 5.5V enables support for applications that require an alkaline battery (1-cell) or Ni-HM (1-cell) power supply. The output voltage can be set from 1.8V to 5.0V (±2.0%) in steps of 0.1V (semi custom). PFM synchronous control enables a low quiescent current, making these products ideal for portable devices that require high efficiency. The XCL101 features a load disconnect function to break continuity between the input and output at shutdown (XCL101A), and also a bypass mode function to maintain continuity between the input and output (XCL101C).

Features

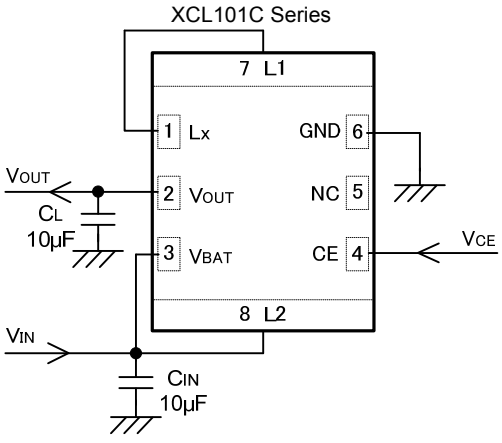
Input Voltage: 0.7V ~ 5.5V
(Absolute Max. Rating: 7.0V)
Fixed Output Voltage: 1.8V~5.0V (±2.0%) (Standard Voltage)
Output Current: 100mA@V_{OUT}=3.3V, V_{BAT}=1.8V (TYP.)
Quiescent Current: 6.3μA (V_{BAT}=V_{OUT}+0.5V)
Control Method: PFM Control
PFM Switching Current: 350mA
Functions: Load Disconnection Function or Bypass Mode Function
Output Capacitor: Ceramic Capacitor Compatible
Operating Ambient Temperature: -40℃ ~ +85℃
Package: CL-2025-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



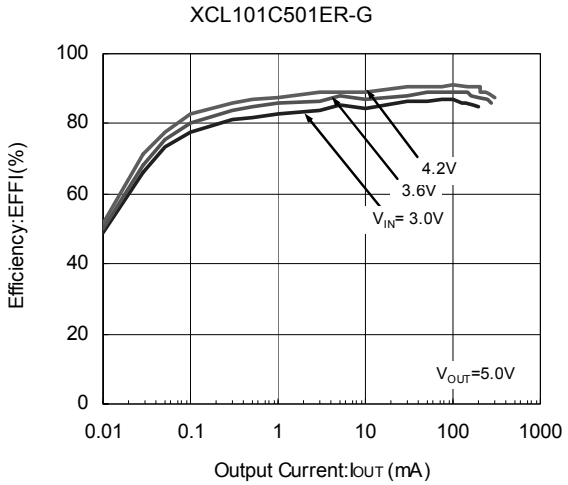
CL-2025-02
(BOTTOM VIEW)

Typical Application Circuit



(TOP VIEW)
(Note) 『L1 and Lx』 are connecting on PCB

Typical Performance Characteristics



Ordering Information

XCL101①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Product Type	A	Load Disconnection
		C	V_{BAT} Bypass
②③	Output Voltage	18～50	Output Voltage e.g. V_{OUT}=1.8V ⇒ ②=1, ③=8
④	Oscillation Frequency	1	1.2MHz
⑤⑥-⑦ (*1)	Package (Order Unit)	ER-G	CL-2025-02 (3,000pcs/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

*GreenOperation-compatible

XCL301 Series

Inductor Built-in Inverting “micro DC/DC” Converters

General Description

The XCL301 series is a inverting micro DC/DC converter which integrates a P-channel FET, an inductor and a control IC in one tiny package (2.5mm ×2.0mm, H=1.00mmMAX). A wide operating voltage range of 2.7V to 5.5V enables support for applications that require an internally fixed output voltage (-3.3V).

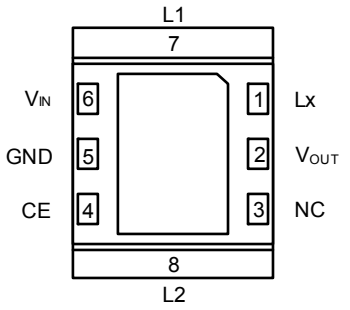
The XCL301 series uses automatic PFM/fixed off time PWM. In automatic PFM/fixed off time PWM control, the IC operates by PFM control when the load is light to achieve high efficiency over the full load range from light to heavy. The device provides a stable inverting power supply to be configured using only a SBD and two capacitors connected externally.

During stand-by, all circuits are shutdown to reduce current consumption to as low as 0.1μA(TYP) or less. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage becomes 2.2V or lower. The XCL301 integrate CL High Speed discharge function which enables the electric charge at the output capacitor CL to be discharged via the internal discharge.

Features

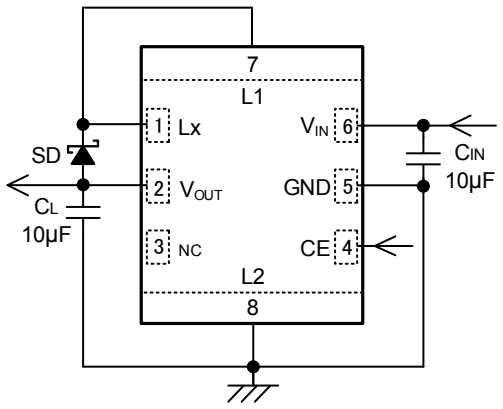
Input Voltage Range: 2.7V~5.5V
Output Voltage: -3.3V
Output Voltage accuracy: ±2.0%
Output Current: -50mA
Internal Driver: 1.2Ω
Quiescent Current: 40μA (TYP.)
Control Methods: PFM / Fixed off time PWM Auto
Transient Response: -50mV
(V_{IN}=3.3V,V_{OUT}=-3.3V,I_{OUT}=1mA→50mA)
PFM switch Current: 550mA
Function: Current Limit
Soft-start
C_L High Speed Discharge
UVLO
C_L High Speed Discharge
Operating Ambient Temperature: -40～+85℃
Package: CL-2025-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

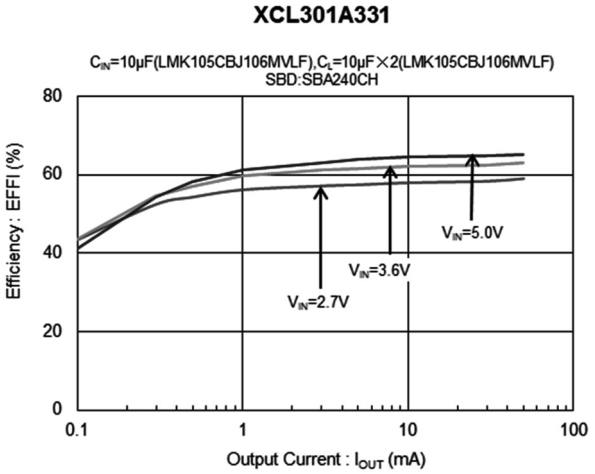


(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XCL301①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Product Type	A	C_L Discharge, UVLO, Current Limit, Soft-start
②③	Output Voltage	33	Output Voltage = -3.3V
④	PFM Switch Current	1	550mA (TYP.)
⑤⑥-⑦ (*1)	Package (Order Unit)	ER-G	CL-2025-02 (3,000pcs/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9281/XC9282 Series

HiSAT-COT®Control, Extremely Small 600mA Synchronous Step-Down DC/DC Converters

General Description

The XC9281/XC9282 series are 600mA synchronous rectification DC/DC converters adopting HiSAT-COT (*) control. Due to increasing the oscillation frequency to high frequency, 0.47uH coil with a size of 1.0 x 0.5 mm can be used. A 0.6 x 0.3 mm ceramic capacitor can be used for the input capacitance (C_{IN}) and the output capacitance (C_L), realizing that the mounting area including peripheral components can be reduced to 6.6 mm^2.

Due to increasing the oscillation frequency to a high frequency, the mounting area is reduced. Additionally, an efficiency equal to or higher than that of conventional products can realize by improving on-resistance and current consumption. Because of these features, XC9281/XC9282 series are ideal for equipment requiring miniaturization and low profile mounting area, and battery-powered equipment such as mobile equipment.

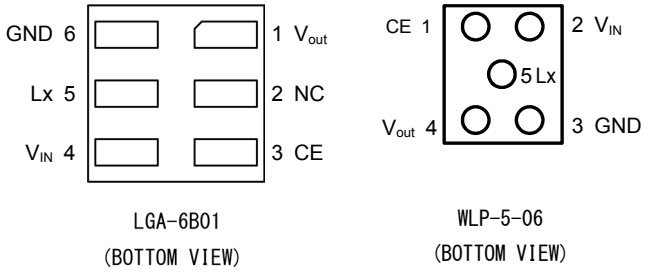
Moreover, the high-speed transient response technology of the HiSAT-COT control makes it possible to minimize the fluctuation of the output voltage for a load transient condition. This feature is optimal for applications requiring a fast response and output voltage stability for an instantaneous load fluctuation like FPGA.

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

Features

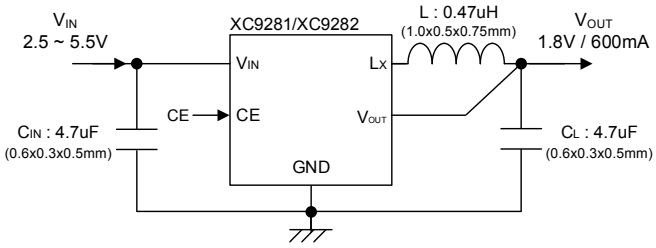
Input Voltage Range	:	2.5V～5.5V
Output Voltage Range	:	0.7V～1.15V(±2.0%) 1.2V～3.6V(±1.5%)
Output Current	:	600mA
Quiescent Current	:	11μA(XC9282 PWM/PFM Auto)
Oscillation Frequency	:	6MHz
Efficiency	:	89%(V_{IN}=3.7V,V_{OUT}=1.8V,I_{OUT}=300mA)
Control Methods	:	HiSAT-COT Control PWM Control (XC9281) PWM/PFM Auto (XC9282)
Protection Functions	:	Current Limit
Functions	:	Soft-Start, UVLO CL Discharge (Type B)
Input / Output Capacitor	:	Ceramic Capacitor
Operating Ambient Temperature	:	- 40℃ ～ + 105℃
Package	:	LGA-6B01(1.2 x 1.2 x 0.3mm) WLP-5-06(0.88 x 0.96 x 0.33mm)
Environmentally	:	EU RoHS Compliant, Pb Free

Pin Configuration



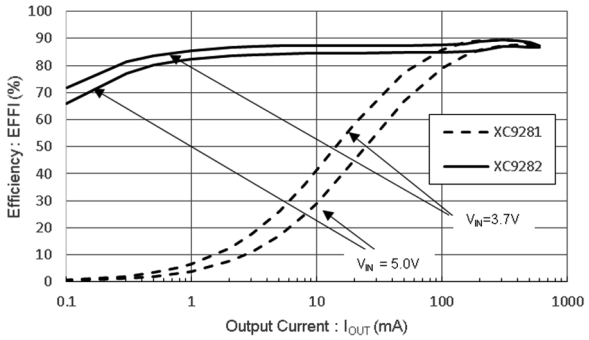
LGA-6B01 (BOTTOM VIEW)　　WLP-5-06 (BOTTOM VIEW)

Typical Application Circuit



Typical Performance Chracteriarics

XC9281B18E / XC9282B18E (V_{OUT}=1.8V)
L = 0.47μH (DFE18SANR47MG0L)
C_{IN} = 4.7μF (GRM035R60J475ME15) C_L = 4.7μF (GRM035R60J475ME15)



Ordering Information

XC9281①②③④⑤⑥-⑦ PWM control
XC9282①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Without C_L Discharge
		B	With C_L Discharge
②③	Output Voltage	07～36	Output voltage options e.g. 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V increments : 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Oscillation Frequency	E	6MHz
⑤⑥-⑦ (*1)	Packages (Order Unit)	1R-G	LGA-6B01 (5,000pcs / Reel)
		0R-G	WLP-5-06 (5,000pcs / Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9280 Series

18V Operation 3A Peak Synchronous Step-Down DC/DC Converters

RoHS Compliant, Halogen Antimony FREE

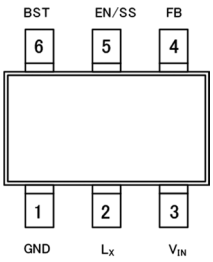
General Description

The XC9280 series is 18V bootstrap synchronous step-down DC/DC converter with built-in Nch-Nch driver transistors.
The XC9280 series has operating voltage range of 4.5V～18.0V and it can support 3A as an output current with high-efficiency. Compatible with Low ESR capacitors such as ceramic capacitors for the load capacitor (C_L).
0.75V reference voltage source is incorporated in the IC, and the output voltage can be set to a value from 1.0V to 7.0V using external resistors (R_{FB1}, R_{FB2}).
Switching frequency is 1.2MHz. In PWM/PFM automatic switchover control, IC can change the control method between PWM and PFM based on the output current requirement and as a result IC can achieve high efficiency over the full load range.
XC9280 has a fixed internal soft start time which is 1.0ms (TYP.), additionally the time can be extended by using an external resistor and capacitor.
With the built-in UVLO function, the driver transistor is forced OFF when input voltage goes down to 3.9V or lower.
Over current protection, short-circuit protection and thermal shutdown are embedded and they secure a safety operation.

Features

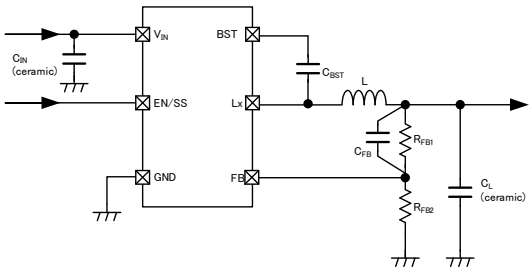
Input Voltage Range: 4.5V～18V (Absolute Max. Rating : 20V)
Output Voltage: 1.8V～7.0V or V_{IN}×0.7
FB Voltage: 0.75V (±1.5%)
Oscillation Frequency: 1.2MHz
Output Current: 3.0A peak (It depends on the conditions)
2.0A DC (V_{IN}=12V V_{out}=5V)
Control Method: PWM/PFM Automatic
Soft-start Time: 0.95ns
Adjustable by RC
Protection Circuits: UVLO
Over Current Protection
(Automatic Recovery)
Thermal Shutdown
Low ESR Ceramic Capacitor: Ceramic Capacitor
Operation Ambient Temperature: -40～+105℃
Package: TSOT-26
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

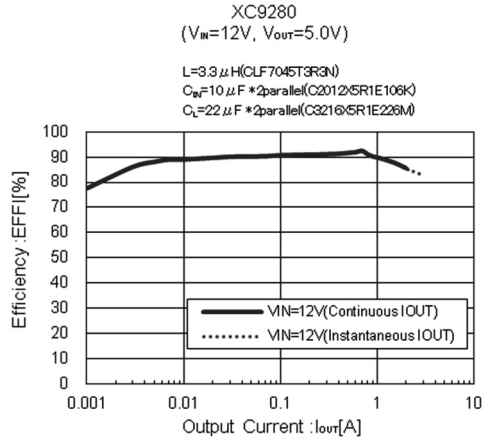


TSOT-26
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9280①②③④⑤⑥-⑦(*1)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to Selection Guide
②③	Adjustable Output Voltage	75	Output voltage can be adjusted in 1V to 7V
④	Oscillation Frequency	C	1.2MHz
⑤⑥-⑦(*1)	Package (Order Unit)	YR-G	TSOT-26 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	CHIP ENABLE	UVLO	THERMAL SHUTDOWN
A	Yes	Yes	Yes

TYPE	SOFT-START	CURRENT LIMITER	AUTOMATIC RECOVERY (CURRENT LIMITER)
A	Yes	Yes	Yes

XC9273 Series

HiSAT-COT® Control, 3A Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

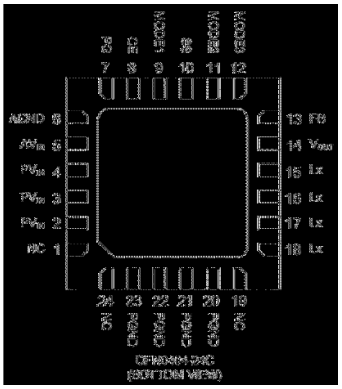
The XC9273 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. The small on-resistance of these two internal driver transistors enable a high efficiency, stable power supply with an output current up to 3.0A. 0.6V reference voltage source is incorporated, and the output voltage can be set freely by external resistors. Oscillation frequency is set to 1.2MHz or 3.0MHz can be selected for suiting to your particular application. The operation mode is HISAT-COT(*) control, which has an excellent transient response. PWM control or PWM/PFM auto switching control can be selected at the MODE1 pin, and a high-speed response, low ripple, and high efficiency are achieved across the entire load range (from light loads to heavy loads). During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0μA or less. As for the soft-start function as fast as 0.25ms in typical for quick turn-on. The soft start time can be set as desired by adding an external capacitance to the SS pin. Internal protection circuits include over current protection, short-circuit protection, and thermal shutdown circuits to enable safe use. Short circuit protection or Hiccup mode can be selected at the MODE2 pin. Soft-off function can be selected at the MODE3 pin. The package is the QFN0404-24C（4mm X 4mm）

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

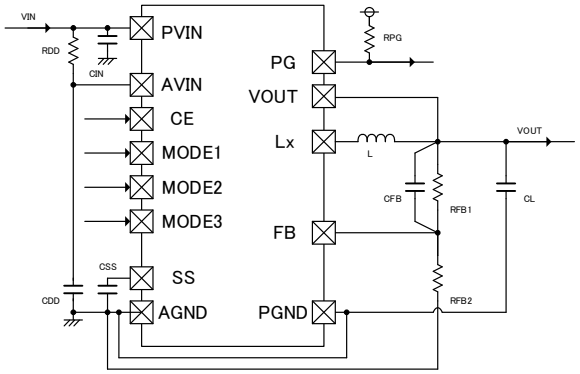
Features

Input Voltage Range: 2.7V～5.5V (Absolute Max. rating: 6.2V)
Output Voltage Range: 0.8V～3.6V
FB Voltage: 0.6V (±1.0%)
Output Current: 3.0A
Oscillation Frequency: 1.2MHz, 3.0MHz
Efficiency: 93% (V_{IN}=5.0V, V_{OUT}=1.8V, I_{OUT}=1.0A)
Control Methods: HiSAT-COT Control
100% Duty Cycle
Mode select between
Fixed PWM and PWM/PFM Auto
Protection Circuits: Thermal Shutdown
Current Limit (Pendent character)
HICCUP or Short Circuit Protection
Functions: UVLO , Soft-Start, Soft-off
C_L High Speed Discharge
Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+105℃
Package: QFN0404-24C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



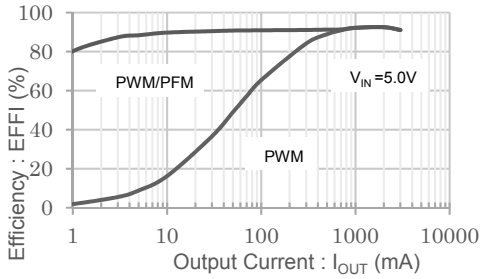
Typical Application Circuit



Typical Performance Characteristics

XC9273B06C

V_{OUT}=1.8V, fosc=1.2MHz L=0.56μH(MWSA0603), C_{IN}=47μF(GRM31CR61A476ME15L)
C_L=47μF(GRM31CR60J476MF19L), R_{FB1}=36kΩ, R_{FB2}=18kΩ, C_{FB}=1500pF



Ordering Information

XC9273①②③④⑤⑥-⑦ PWM control
PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	B	Refer to Selection Guide
②③	FB Voltage	06	FB Voltage 0.6V
④	Oscillation Frequency	C	1.2MHz
		D	3.0MHz
⑤⑥-⑦(*1)	Package (Order Unit)	ZR-G	QFN0404-24C (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	C_L AUTO-DISCHARGE WITH SOFT-OFF	SHORT PROTECTION WITH LATCH OR HICCUP MODE
B	Yes	Yes

TYPE	UVLO	CHIP ENABLE	CURRENT LIMIT	SOFT START TIME	THERMAL SHUTDOWN
B	Yes	Yes	Yes	Adjustable	Yes

*GreenOperation-compatible

XC9274/XC9275 Series

HiSAT-COT® Control, 3A Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

The XC9274/XC9275 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. The small on-resistance of these two internal driver transistors enable a high efficiency, stable power supply with an output current up to 3.0A. 0.6V reference voltage source is incorporated, and the output voltage can be set freely by external resistors. Oscillation frequency is set to 1.2MHz or 3.0MHz can be selected for suiting to your particular application. The operation mode is HISAT-COT(*) control excellent in transient response, the XC9274 series is PWM control, the XC9275 series is PWM/PFM auto switching control, allowing fast response, low ripple and high efficiency over the full range of loads (from light load to heavy load).

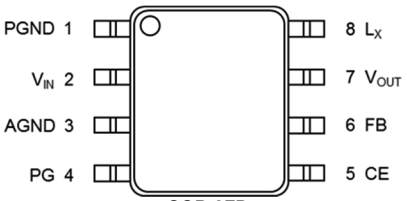
During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0μA or less. As for the soft-start function as fast as 0.25ms in typical for quick turn-on. The soft start time can be set as desired by adding an external capacitance to the SS pin. Internal protection circuits include over current protection, short-circuit protection, and thermal shutdown circuits to enable safe use. Short circuit protection or auto recovery by Hiccup mode, and C_L High Speed discharge function or Soft-off function can be selected. The package is the SOP-8FD.

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

Features

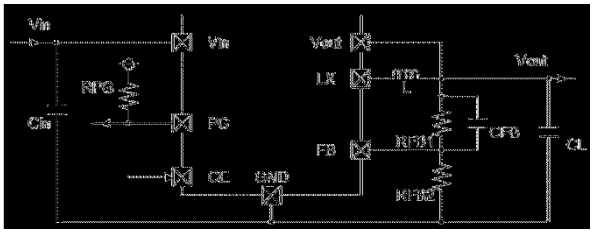
Input Voltage Range:	2.7V～5.5V (Absolute Max. Rating: 6.2V)
Output Voltage Range:	0.8V～3.6V
FB Voltage:	0.6V (±1.0%)
Output Current:	3.0A
Oscillation Frequency:	1.2MHz, 3.0MHz
Efficiency:	93% (V_{IN}=5.0V, V_{OUT}=3.3V, I_{OUT}=1.0A)
Control Methods:	HiSAT-COT Control 100% Duty Cycle
Protection Circuits:	Thermal Shutdown Current Limit (Pendent character) Hiccup (Type D/E) Short Circuit Protection (Type B/C)
Functions:	UVLO , Soft-Start, Soft-off (Type B/D) C_L High Speed Discharge
Capacitor:	Ceramic Capacitor
Operating Ambient Temperature:	-40℃～+105℃
Packages:	SOP-8FD
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



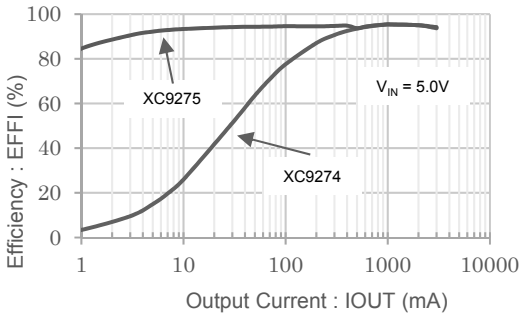
SOP-8FD
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

V_{OUT}=3.3V, fosc=1.2MHz L=0.56μH(MWSA6030),C_{IN}=47μF(GRM31CR61A476ME15L)
C_L=47μF(GRM31CR60J476ME19L),R_{FB1}=68kΩ,R_{FB2}=15kΩ,C_{FB}=820pF



Ordering Information

XC9274①②③④⑤⑥-⑦ PWM control
XC9275①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	-	Refer to Selection Guide
②③	FB Voltage	06	FB Voltage 0.6V
④	Oscillation Frequency	C	1.2MHz
		D	3.0MHz
⑤⑥-⑦(*1)	Package (Order Unit)	QR-G	SOP-8FD (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	SHORT PROTECTION WITH LATCH	HICCUP MODE	C_L AUTO-DISCHARGE	SOFT-OFF	UVLO
B	Yes	No	Yes	Yes	Yes
C	Yes	No	Yes	No	Yes
D	No	Yes	Yes	Yes	Yes
E	No	Yes	Yes	No	Yes

TYPE	CHIP ENABLE	CURRENT LIMT	SOFT-START TIME	THERMAL SHUTDOWN	POWER GOOD
B	Yes	Yes	Fixed	Yes	Yes
C	Yes	Yes	Fixed	Yes	Yes
D	Yes	Yes	Fixed	Yes	Yes
E	Yes	Yes	Fixed	Yes	Yes

XC9272 Series

Ultra Low Power Synchronous Step-Down PFM DC/DC Converter for Low Output Voltage

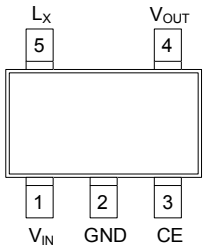
General Description

XC9272 series are Ultra Low Power synchronous-rectification type PFM step down DC/DC converters with a built-in 0.4Ω (TYP.) Pch driver and 0.4Ω (TYP.) Nch synchronous switching transistor, designed to allow the use of ceramic capacitor.
PFM control enables a low quiescent current, making these products ideal for battery operated devices that require high efficiency and long battery life.
Only inductor, C_{IN} and C_L capacitors are needed as external parts to make a step down DC/DC circuit.
Operation voltage range is from 2.0V to 6.0V. This product has fixed output voltage from 0.6V to 0.95V(accuracy: ±20mV) in increments of 0.05V.
During stand-by, all circuits are shutdown to reduce consumption to as low as 0.1μA(TYP.) or less.
With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage gets lower than UVLO detection voltage. Besides, XC9272 series has UVLO release voltage of 1.8V (TYP.).
The product with C_L discharge function, XC9272B type, can discharge C_L capacitor during stand-by mode due to the internal resistance by turning on the internal switch between V_{OUT} -GND. This enables output voltage restored to GND level fast.

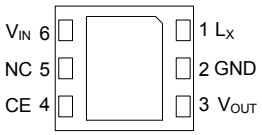
Features

Input Voltage Range: 2.0V~6.0V (Absolute Max. Rating: 7.0V)
Output Voltage Setting: 0.6V~0.95V (±20mV, 0.05V step increments)
Output Current: 50mA
Driver Transistor: 0.4Ω (Pch Driver Tr)
0.4Ω (Nch Synchronous rectifier Switch Tr)
Supply Current: 0.50μA @ $V_{OUT(T)}$=0.7V (TYP.)
Control Method: PFM control
High Speed Transient: 50mV (V_{IN}=3.6V, V_{OUT}=0.7V, I_{OUT}=10μA →50mA)
PFM Switching Current: 180mA
Function: Short Protection
C_L Discharge(XC9272B)
UVLO
Ceramic Capacitor Compatible
Operation Ambient Temperature: -40℃～+85℃
Packages: SOT-25, USP-6EL
Environmentally Friendly: EU RoHS compliant, Pb Free

Pin Configuration

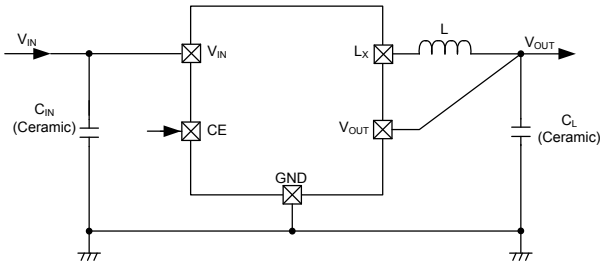


SOT-25
(TOP VIEW)



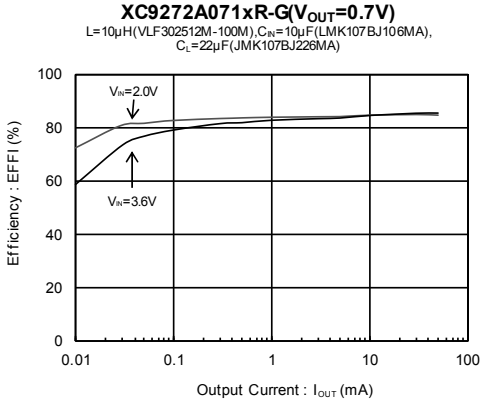
USP-6EL
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9272①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Product Type	A	Without C_L Discharge
		B	With C_L Discharge
②③	Output Voltage	06～09	Output Voltage : e.g. V_{OUT}=0.7V⇒②=0, ③=7 Output Voltage Range: 0.6V～0.95V (0.05V step)
④	Output Voltage Type	1	Output Voltage {x.x0V} (the 2nd decimal place is “0”)
		B	Output Voltage {x.x5V} (the 2nd decimal place is “5”)
⑤⑥-⑦(*1)	Packages (Order Unit)	4R-G	USP-6EL (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9270/XC9271 Series

30V Driver Transistor Built-in Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

The XC9270/XC9271 series are 30V operation step-down DC/DC converter ICs with an internal driver transistor. The internal Nch driver transistor is driven by bootstrap to achieve a stable, high-efficiency power supply up to an output current of 2.0A. Low ESR capacitors such as ceramic capacitors can be used for the load capacitor (C_L).

A 0.8V reference voltage source is incorporated in the IC, and the output voltage can be set to a value from 1.2V to 12.0V using external resistors (R_{FB1}, R_{FB2}).

300kHz or 500kHz can be selected for the switching frequency. The generation of unneeded noise can be reduced by synchronization with an external CLK within the range ±25% of the internal clock using the SYNC pin. In automatic PWM/PFM control, the IC operates by PFM control when the load is light to achieve high efficiency over the full load range from light to heavy.

The soft start time can be set as desired by adding an external capacitance to the SS pin.

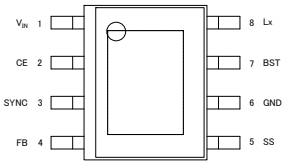
With the built-in UVLO function, the driver transistor is forced OFF when input voltage becomes 4.6V or lower.

Internal protection circuits include over current protection, integral latch protection, short-circuit protection, and thermal shutdown circuits to enable safe use.

Features

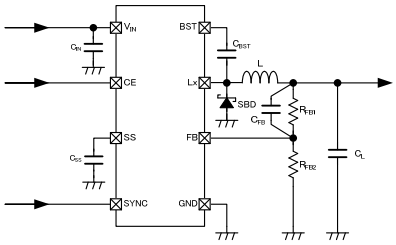
Input Voltage Range: 7.0V～30.0V
(Absolute Max. Rating: 36.0V)
Output Voltage Range: 1.2V～12.0V (V_{FB}=0.8V±2.0%)
Oscillation Frequency: 300kHz, 500kHz
Max. Output Current: 2.0A
Control Method: PWM (XC9270)
PWM/PFM (XC9271)
Soft-start: External Capacitor
Protection Circuit: Over Current Protection 3.2A (TYP.)
Integral Latch Method (XC9270/71A)
Automatic Recovery (XC9270/71B)
Thermal Shutdown
Capacitor: Low ESR Ceramic Capacitor
Operating Ambient Temperature: -40℃ ~ +105℃
Package: SOP-8FD
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



SOP-8FD
(TOP VIEW)

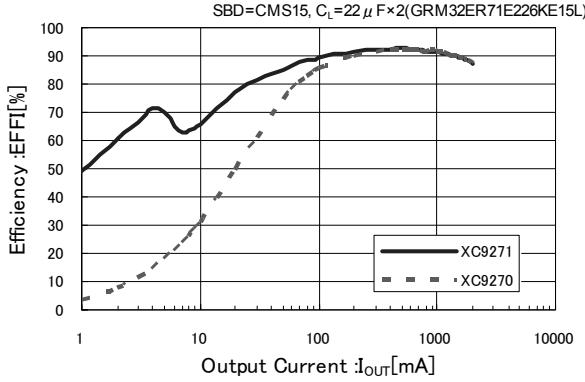
Pin Configuration



Typical Performance Characteristics

XC9270x085/XC9271x085
(V_{IN}=12V , V_{OUT}=5V)

L=15μH(CLF12555-150M), C_{IN1}=10μF(GRM32ER71H106KA12L),
SBD=CMS15, C_L=22μF×2(GRM32ER71E226KE15L)



Ordering Information

XC9270①②③④⑤⑥-⑦ PWM control
XC9271①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Functional selection	A	Latch protection
		B	Foldback protection
②③	FB Voltage	08	FB Voltage 0.8V
④	Oscillation Frequency	3	300kHz
		5	500kHz
⑤⑥-⑦(*1)	Package (Order Unit)	QR-G	SOP-8FD (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

CONTROL METHOD	OVER CURRENT PROTECTION	FREQUENCY	PRODUCT NAME
PWM Fixed	Latching	300kHz	XC9270A083QR-G
		500kHz	XC9270A085QR-G
	Automatic Recovery	300kHz	XC9270B083QR-G
		500kHz	XC9270B085QR-G
PWM/PFM	Latching	300kHz	XC9271A083QR-G
		500kHz	XC9271A085QR-G
	Automatic Recovery	300kHz	XC9271B083QR-G
		500kHz	XC9271B085QR-G

XC9267/XC9268 Series

36V Operation 600mA Synchronous Step-Down DC/DC Converters

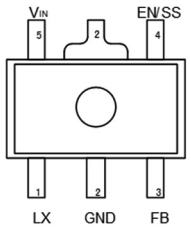
General Description

The XC9267/XC9268 series are 36V operation synchronous step-down DC/DC converter ICs with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor. The XC9267/XC9268 series has operating voltage range of 3.0V～36.0V and high-efficiency power supply up to an output current of 600mA. Low ESR capacitors such as ceramic capacitors can be used for the load capacitor (C_L).
A 0.75V reference voltage source is incorporated in the IC, and the output voltage can be set to a value from 1.0V to 25.0V using external resistors (R_{FB1}, R_{FB2}).
1.2MHz or 2.2MHz can be selected for the switching frequency. In automatic PWM/PFM control, the IC operates by PFM control when the load is light to achieve high efficiency over the full load range from light to heavy.
The soft-start time is internally set to 2.0ms (TYP.), but can be adjusted to set a longer time using an external resistor and capacitor.
With the built-in UVLO function, the driver transistor is forced OFF when input voltage becomes 2.7V or lower.
The output state can be monitored using the power good function.
Internal protection circuits include over current protection, short-circuit protection, and thermal shutdown circuits to enable safe use.

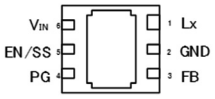
Features

Input Voltage Range: 3～36V (Absolute Max. Rating: 40V)
Output Voltage Range: 1.0V～25V
FB Voltage: 0.75V (±1.5%)
Oscillation Frequency: 1.2MHz, 2.2MHz
Output Current: 600mA
Control Methods: PWM Control (XC9267)
PWM/PFM Auto (XC9268)
Efficiency 85%@12V→5V, 1mA
Soft-start Time: Adjustable by RC
Protection Circuits: Over Current Protection
Thermal Shutdown
Short-circuit Protection
Low ESR Ceramic Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+105℃
Packages: SOT-89-5 (Without Power Good)
: USP-6C (With Power Good)
Environmentally Friendly EU RoHS Compliant, Pb Free

Pin Configuration

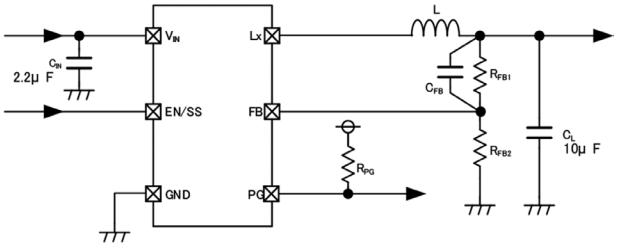


SOT-89-5
(TOP VIEW)



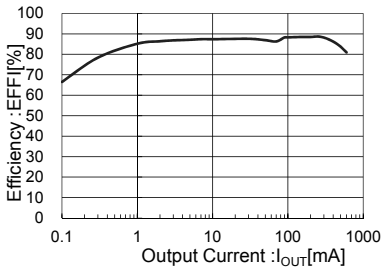
USP-6C
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XC9268B75C (PWM/PFM Auto)
(V_{IN}=12V, V_{OUT}=5V)
L=6.8μH, C_{IN}=2.2μF, C_L=10μF



Ordering Information

XC9267①②③④⑤⑥-⑦(*1) PWM control
XC9268①②③④⑤⑥-⑦(*1) PWM/PFM Auto

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	B	Refer to Selection Guide
②③	FB Voltage	75	FB Voltage 0.75V
④	Oscillation Frequency	C	1.2MHz
		D	2.2MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	PR-G	SOT-89-5 (1,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

●Selection Guide

TYPE	Packages	Current Limiter	Automatic Recovery (Current Limiter)	Chip Enable
B	PR-G	YES	YES	YES

TYPE	Packages	UVLO	Thermal Shutdown	Soft Start	POWER GOOD
B	PR-G	YES	YES	YES	NO

TYPE	Packages	Current Limiter	Automatic Recovery (Current Limiter)	Chip Enable
B	ER-G	YES	YES	YES

TYPE	Packages	UVLO	Thermal Shutdown	Soft Start	POWER GOOD
B	ER-G	YES	YES	YES	YES

*GreenOperation-compatible

XC9266 Series

HiSAT-COT® Control, 6.0A Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

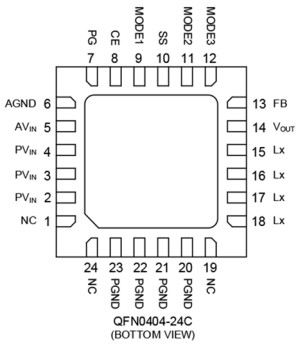
The XC9266 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. The small on-resistances of these two internal driver transistors enable a high efficiency, stable power supply with an output current up to 6.0A. A 0.6V reference voltage source is incorporated, and the output voltage can be set freely by external resistors. Oscillation frequency is set to 1.2MHz or 3.0MHz can be selected for suiting to your particular application. The operation mode is HiSAT-COT(*) control, which has an excellent transient response. PWM control or PWM/PFM auto switching control can be selected at the MODE1 pin, and a high-speed response, low ripple, and high efficiency are achieved across the entire load range (from light loads to heavy loads). During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0 μA or less. As for the soft-start function as fast as 0.25ms in typical for quick turn-on. The soft start time can be set as desired by adding an external capacitance to the SS pin. Internal protection circuits include over current protection, short-circuit protection, and thermal shutdown circuits to enable safe use. Short circuit protection or Hiccup mode can be selected at the MODE2 pin. Soft-off function can be selected at the MODE3 pin. The package is the QFN0404-24C (4mm X 4mm).

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

Features

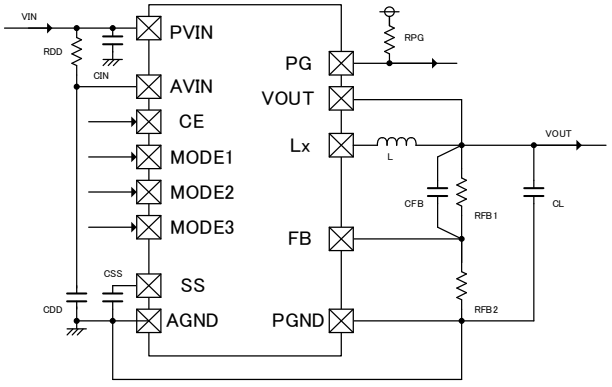
IInput Voltage Range: 2.7V～5.5V (Absolute Maxi Rating: 6.2V)
Output Voltage Range: 0.8V～3.6V
FB Voltage 0.6V (±1.0%)
Output Current: 6.0A
Oscillation Frequency: 1.2MHz, 3.0MHz
Efficiency: 93% (V_{IN}=5.0V, V_{OUT}=1.8V, I_{OUT}=1.0A)
Control Methods: HiSAT-COT Control
100% Duty Cycle
Mode select between
Fixed PWM and PWM/PFM Auto
Protection Circuits: Thermal Shutdown
Current Limit
Hiccup or Short Circuit Protection
Functions: UVLO, Soft-start, Soft-off
C_L High Speed Discharge
Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+105℃
Package: QFN0404-24C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



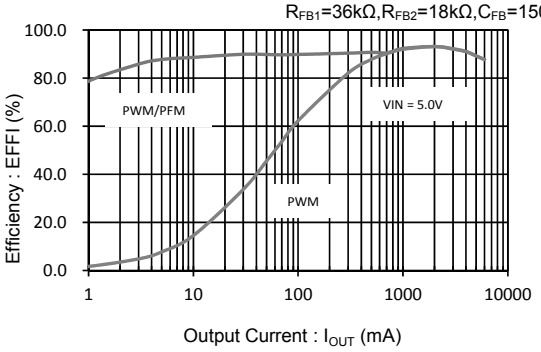
QFN0404-24C
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XC9266B06C V_{OUT}=1.8V, fosc=1.2MHz L=0.47μH(XFL7015-471M), C_{IN}=47μF(GRM31CR61A476ME15L),C_L=47μF(GRM31CR60J476ME19L), R_{FB1}=36kΩ,R_{FB2}=18kΩ,C_{FB}=1500pF



Ordering Information

XC9266①②③④⑤⑥-⑦ PWM control ⇔ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	B	Output Voltage (Adjustable) C_L Auto-Discharge with Soft-off Short Protection with Latch or Hiccup Mode UVLO Chip Enable Current Limit Soft-start (Fixed) Thermal Shutdown Power Good
②③	Adjustable Output Voltage	06	FB Voltage 0.6V
④	Oscillation Frequency	C	1.2MHz
		D	3.0MHz
⑤⑥-⑦(*1)	Package (Order Unit)	ZR-G	QFN0404-24C (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant

XC9265 Series

Ultra Low Power Synchronous Step-Down PFM DC/DC Converter

RoHS Halogen Antimony FREE

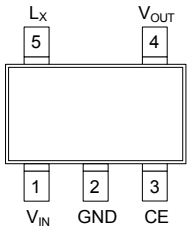
General Description

XC9265 series are Ultra Low Power synchronous-rectification type PFM step down DC/DC converters with a built-in 0.4Ω (TYP.) Pch driver and 0.4Ω (TYP.) Nch synchronous switching transistor, designed to allow the use of ceramic capacitor.
PFM control enables a low quiescent current, making these products ideal for battery operated devices that require high efficiency and long battery life.
Only inductor, C_{IN} and C_L capacitors are needed as external parts to make a step down DC/DC circuit.
Operation voltage range is from 2.0V to 6.0V. This product has fixed output voltage from 1.0V to 4.0V (±2.0%) in increments of 0.05V.
During stand-by, all circuits are shutdown to reduce consumption to as low as 0.1μA (TYP.) or less.
With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage gets lower than UVLO detection voltage. Besides, XC9265 series has UVLO release voltage of 1.8V (TYP.).
The product with C_L discharge function can discharge C_L capacitor during stand-by mode due to the internal resistance by turning on the internal switch between V_{OUT} -GND. This enables output voltage restored to GND level fast.

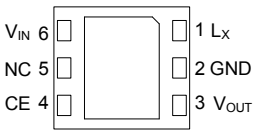
Features

Input Voltage Range: 2.0V～6.0V
Output Voltage Setting: 1.0V～4.0V (±2.0%, 0.05V increments)
Output Current: 200mA (XC9265A/C)
50mA(XC9265B/D)
Driver Transistor: 0.4Ω (P-ch Driver Tr.)
0.4Ω (N-ch Synchronous rectifier switch Tr.)
Quiescent Current: 0.5μA (V_{OUT}=1.8V (TYP.))
Control Method: PFM control
High Speed Transient: 50mV
(V_{IN}=3.6V,V_{OUT}=1.8V,I_{OUT}=10μA→50mA)
Function: Short Protection
C_L Discharge (XC9265C/ D)
UVLO
Operation Ambient Temperature: -40℃～+85℃
Packages: SOT-25, USP-6EL
Environmentally Friendly: EU RoHS compliant, Pb Free

Pin Configuration

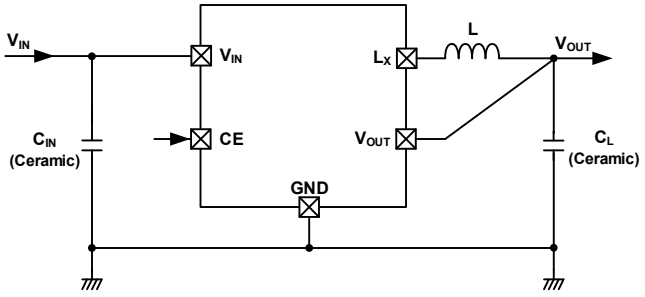


SOT-25
(TOP VIEW)



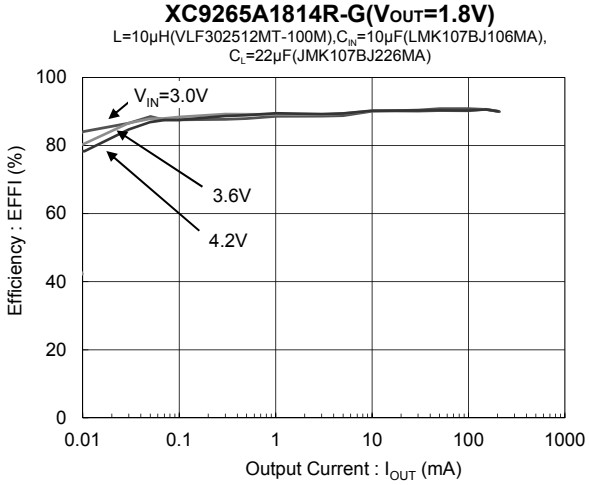
USP-6EL
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9265①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Product Type	A	I_{OUT}=200mA Without C_L Auto Discharge
		B	I_{OUT}=50mA Without C_L Auto Discharge
		C	I_{OUT}=200mA With C_L Auto Discharge
		D	I_{OUT}=50mA With C_L Auto Discharge
②③	Output Voltage	10～40	Output Voltage : e.g. V_{OUT}=1.80V⇒②=1, ③=8 Output Voltage Range: 1.0V～4.0V (0.05V step)
④	Output Voltage Type	1	Output Voltage {x.x0V} (the 2nd decimal place is "0")
		B	Output Voltage {x.x5V} (the 2nd decimal place is "5")
⑤⑥-⑦(*1)	Packages (Order Unit)	4R-G	USP-6EL (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

*GreenOperation-compatible

XC9263/XC9264 Series

18V Operation 0.5A Synchronous Step-Down DC/DC Converters

RoHS
Halogen Antimony FREE

General Description

The XC9263/XC9264 series are 18V operation synchronous step-down DC/DC converter ICs with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor. The XC9263/XC9264 series has operating voltage range of 3.0V～18.0V and high-efficiency power supply up to an output current of 0.5A. Low ESR capacitors such as ceramic capacitors can be used for the load capacitor (C_L).

A 0.75V reference voltage source is incorporated in the IC, and the output voltage can be set to a value from 1.0V to 15.0V using external resistors (R_{FB1}, R_{FB2}).

500kHz or 1.2MHz or 2.2MHz can be selected for the switching frequency. In automatic PWM/PFM control, the IC operates by PFM control when the load is light to achieve high efficiency over the full load range from light to heavy.

The soft-start time is internally set to 1ms (TYP.), but can be adjusted to set a longer time using an external resistor and capacitor.

With the built-in UVLO function, the driver transistor is forced OFF when input voltage becomes 2.7V or lower.

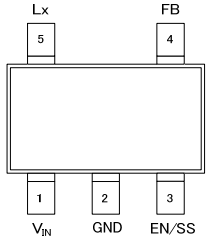
The output state can be monitored using the power good function.

Internal protection circuits include over current protection, short-circuit protection, and thermal shutdown circuits to enable safe use.

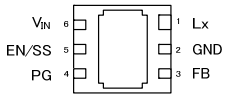
Features

Input Voltage Range: 3.0V～18.0V
(Absolute Max. Rating: 20.0V)
Output Voltage Range: 1.0V～15V
FB Voltage: 0.75V (±1.5%)
Oscillation Frequency: 500kHz, 1.2MHz, 2.2MHz
Output Current: 0.5A
Control Methods: PWM/PFM Auto
Efficiency 85%@12V→5V, 1mA
PWM control
Soft-start Time: Adjustable by RC
Protection Circuits: Over Current Protection
Automatic Recovery (Type B)
Integral Latch Method (Type A)
Thermal Shutdown
Low ESR Ceramic Capacitor: Ceramic Capacitor
Packages: SOT-25 (without Power Good function)
USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

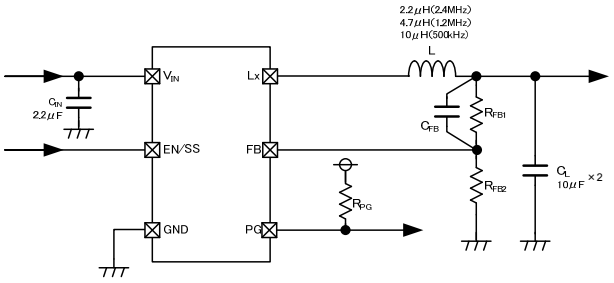


SOT-25
(TOP VIEW)

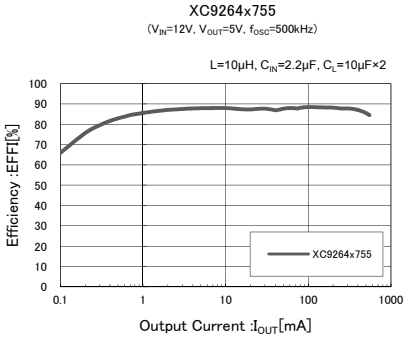


USP-6C
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9263①②③④⑤⑥-⑦(*1) PWM control
XC9264①②③④⑤⑥-⑦(*1) PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to Selection Guide
		B	
②③	FB Voltage	75	FB Voltage 0.75V
④	Oscillation Frequency	5	500kHz
		C	1.2MHz
		D	2.2MHz
⑤⑥-⑦	Packages (Order Unit)	MR-G(*1)	SOT-25 (3,000pcs/Reel)
		ER-G(*1)	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	PACKAGE	CURRENT LIMITTER	AUTOMATIC RECOVERY (CURRENT LIMITTER)	LATCH PROTECTION (CURRENT LIMITTER)	CHIP ENABLE
A	MR-G	YES	NO	YES (*1)	YES
B		YES	YES	NO	YES

TYPE	PACKAGE	CURRENT LIMITTER	AUTOMATIC RECOVERY (CURRENT LIMITTER)	LATCH PROTECTION (CURRENT LIMITTER)	CHIP ENABLE
A	ER-G	YES	NO	YES (*1)	YES
B		YES	YES	NO	YES

TYPE	PACKAGE	UVLO	THERMAL SHUTDOWN	SOFT START	POWER GOOD
A	MR-G	YES	YES	YES	NO
B		YES	YES	YES	NO

TYPE	PACKAGE	UVLO	THERMAL SHUTDOWN	SOFT START	POWER GOOD
A	ER-G	YES	YES	YES	YES
B		YES	YES	YES	YES

(*1) The over-current protection latch is an integral latch type.

XC9262 Series

HiSAT-COT® Control, Ultra Small 1.5A Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

The XC9262 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. Output voltage is internally set in a range from 0.8V to 3.6V (±2.0%) increments of 0.05V. The device provides a high efficiency, stable power supply with an output current of 1.5A to be configured using only a coil and two capacitors connected externally. Oscillation frequency is set to 1.2MHz or 3MHz can be selected for suiting to your particular application.

The operation mode is HISAT-COT(*) control, which has an excellent transient response. PWM control or PWM/PFM auto switching control can be selected at the MODE pin, and a high-speed response, low ripple, and high efficiency are achieved across the entire load range, from light loads to heavy loads.

During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0 μA or less. As for the soft-start function as fast as 0.30ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage becomes 2.0V or lower. The B types integrate C_L High Speed discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge.

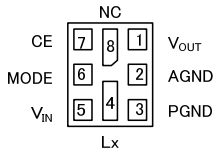
The package is the ultra-small 1.2mm × 1.4mm × h0.3mm LGA-8B01.

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

Features

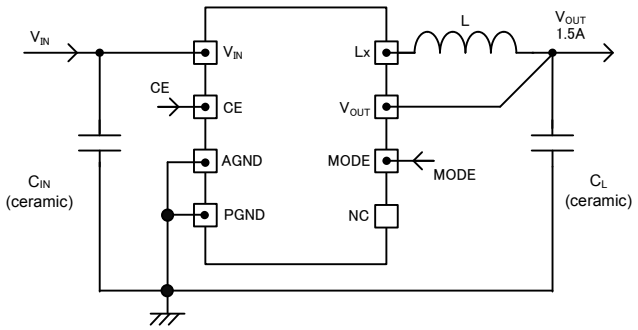
Input Voltage Range:	2.7V～5.5V (Absolute Max. Rating: 6.2V)
Output Voltage Range:	0.8V～3.6V (±2.0%)
Quiescent Current:	25 μA (f_{OSC}=3MHz)
Output Current:	1.5A
Oscillation Frequency:	1.2MHz, 3MHz
Efficiency:	90% (V_{IN}=3.7V, V_{OUT}=1.8V, I_{OUT}=200mA)
Control Methods:	HiSAT-COT Control 100% Duty Cycle PWM Control PWM/PFM Auto
Protection Circuits:	Thermal Shutdown Current Limit (Pendent character) Short Circuit Protection (Type B)
Functions:	Soft-start UVLO C_L High Speed Discharge (Type B)
Capacitor:	Ceramic Capacitor
Operating Ambient Temperature:	- 40℃ ～ + 105℃
Package:	LGA-8B01
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration

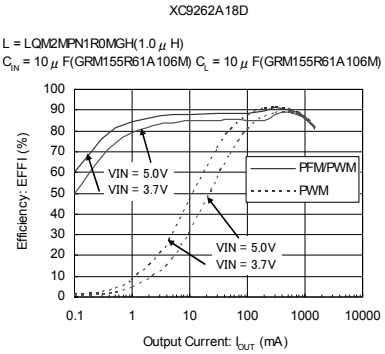


LGA-8B01
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9262①②③④⑤⑥-⑦ PWM control ⇔PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to [Selection Guide]
		B	
②③	Output Voltage	08～36	Output voltage options e.g. 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V increments : 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Oscillation Frequency	C	1.2MHz
		D	3MHz
⑤⑥-⑦(*1)	Package (Order Unit)	1R-G	LGA-8B01 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	C_L AUTO-DISCHARGE	SHORT PROTECTION (LATCH)	UVLO
A	Fixed	No	No	Yes
B	Fixed	Yes	Yes	Yes

TYPE	CHIP ENABLE	CURRENT LIMIT	SOFT-START TIME	THERMAL SHUTDOWN
A	Yes	Yes	Fixed	Yes
B	Yes	Yes	Fixed	Yes

*GreenOperation-compatible

XC9260/XC9261 Series

HiSAT-COT® Control, 1.5A Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

The XC9260/XC9261 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. Output voltage is internally set in a range from 0.8V to 3.6V (2.0%) increments of 0.05V. The device provides a high efficiency, stable power supply with an output current of 1.5A to be configured using only a coil and two capacitors connected externally. Oscillation frequency is set to 1.2MHz or 3MHz can be selected for suiting to your particular application. As for operation mode HiSAT-COT (*) control excellent in transient response , the XC9260 series is PWM control, the XC9261 series is automatic PWM/PFM switching control, allowing fast response, low ripple and high efficiency over the full range of loads (from light load to heavy load).

During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0μA or less. As for the soft-start function as fast as 0.30ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage becomes 2.0V or lower. The B types integrate C_L High Speed discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge.

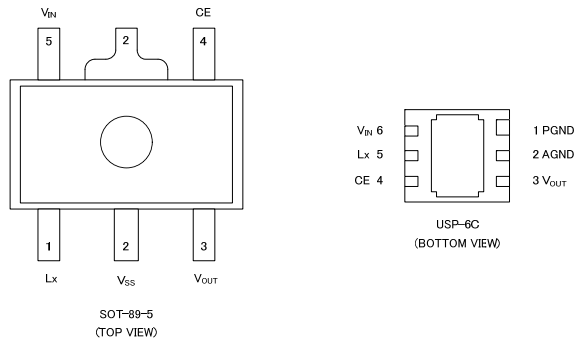
Two types of package SOT-89-5, USP-6C are available.

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

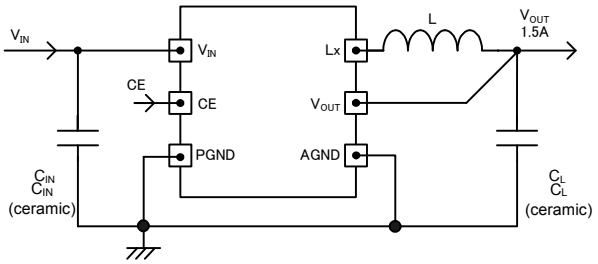
Features

Input Voltage Range: 2.7V～5.5V
(Absolute Max. Rating: 6.2V)
Output Voltage Range: 0.8V～3.6V (±2.0%)
Quiescent Current: 25μA(f_{OSC} = 3MHz)
Output Current: 1.5A
Oscillation Frequency: 1.2MHz, 3MHz
Efficiency: 90%
(V_{IN}=3.7V, V_{OUT}=1.8V, I_{OUT}=200mA)
Control Methods: HiSAT-COT Control
100% Duty Cycle
PWM Control (XC9260)
PWM/PFM Auto (XC9261)
Protection Circuits: Thermal Shutdown
Current Limit (Pendent character)
Short Circuit Protection (Type B)
Functions: Soft-start
UVLO
C_L High Speed Discharge (Type B)
Capacitor: Ceramic Capacitor
Operating Ambient Temperature: - 40℃ ～ + 105℃
Packages: SOT-89-5,USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



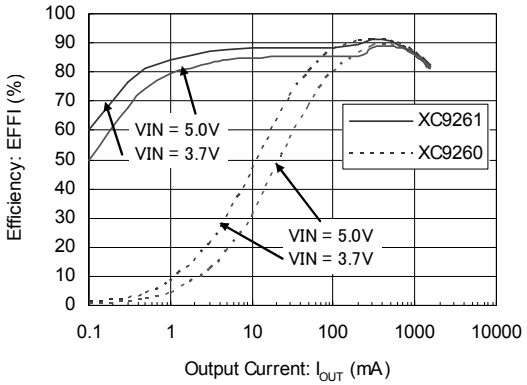
Typical Application Circuit



Typical Performance Characteristics

XC9260A18D / XC9261A18D

L = LQM2MPN1R0MGH(1.0μH)
C_{IN}=10μF(GRM155R61A106M) C_L=10μF(GRM155R61A106M)



Ordering Information

XC9260①②③④⑤⑥-⑦ PWM control
XC9261①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to [Selection Guide]
		B	
②③	Output Voltage	08～36	Output voltage options e.g. 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V increments : 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Oscillation Frequency	C	1.2MHz
		D	3MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	PR-G	SOT-89-5 (1,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	C_L AUTO-DISCHARGE	SHORT PROTECTION (LATCH)	UVLO
A	Fixed	No	No	Yes
B	Fixed	Yes	Yes	Yes

TYPE	CHIP ENABLE	CURRENT LIMIT	SOFT-START TIME	THERMAL SHUTDOWN
A	Yes	Yes	Fixed	Yes
B	Yes	Yes	Fixed	Yes

XC9259 Series

HiSAT-COT® Control, Ultra Small 1A Synchronous Step-Down DC/DC Converters

General Description

The XC9259 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. Output voltage is internally set in a range from 0.8V to 3.6V (±2.0%) increments of 0.05V. The device provides a high efficiency, stable power supply with an output current of 600mA to be configured using only a coil and two capacitors connected externally. Oscillation frequency is set to 1.2MHz or 6MHz can be selected for suiting to your particular application. As for operation mode HiSAT-COT(*) control excellent in transient response, the XC9259 has PWM control and automatic PWM/PFM switching control, allowing fast response, low ripple and high efficiency over the full range of loads (from light load to heavy load).

During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0μA or less. As for the soft-start function as fast as 0.30ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage becomes 1.6V or lower. The B types integrate C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge.

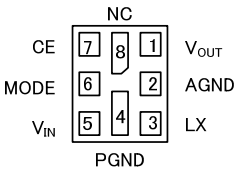
Package is available in LGA-8B01 (1.2mm x 1.4mm x h0.3mm).

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

Features

Input Voltage Range: 2.5V～5.5V
Output Voltage Range: 0.8V～3.6V
Oscillation Frequency: 1.2MHz, 6MHz
Output Current: 1A
Control Methods: HiSAT-COT Control
100% Duty Cycle
PWM Control
PWM/PFM Auto
Protection Circuits: Thermal Shutdown
Current Limit (Pendent character)
Short Circuit Protection (Type B)
Functions: Soft-start
UVLO
C_L Discharge (Type B)
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃~ +105℃
Package: LGA-8B01
Environmentally Friendly: EU RoHS Compliant, Pb Free

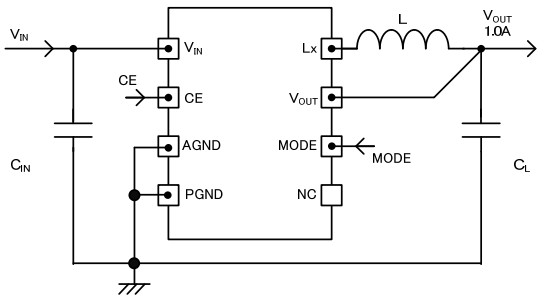
Pin Configuration



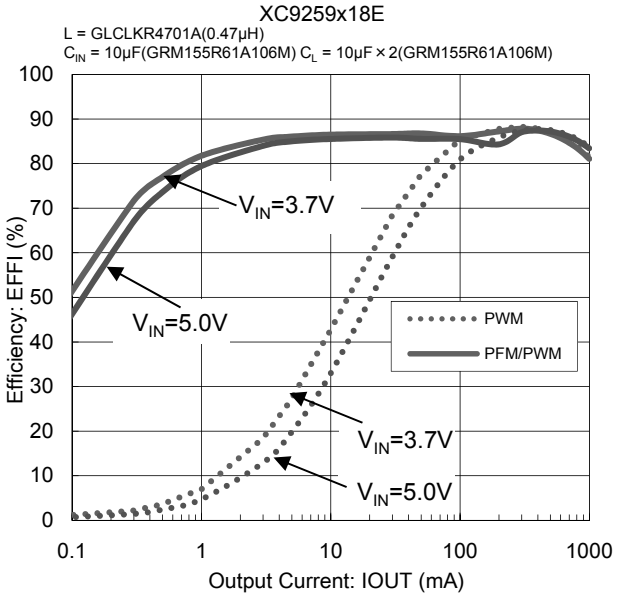
LGA-8B01

(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9259①②③④⑤⑥-⑦ PWM control ⇔PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to [Selection Guide]
		B	
②③	Output Voltage	08～36	Output voltage options e.g. 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V increments : 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Oscillation Frequency	C	1.2MHz
		E	6MHz
⑤⑥-⑦(*1)	Package (Order Unit)	1R-G	LGA-8B01 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	C_L AUTO-DISCHARGE	SHORT PROTECTION (LATCH)	UVLO
A	Fixed	No	No	Yes
B	Fixed	Yes	Yes	Yes

TYPE	CHIP ENABLE	CURRENT LIMIT	SOFT-START TIME	THERMAL SHUTDOWN
A	Yes	Yes	Fixed	Yes
B	Yes	Yes	Fixed	Yes

XC9257/XC9258 Series

HiSAT-COT® Control, 1A Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

The XC9257/XC9258 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. Output voltage is internally set in a range from 0.8V to 3.6V (±2.0%) increments of 0.05V. The device provides a high efficiency, stable power supply with an output current of 600mA to be configured using only a coil and two capacitors connected externally. Oscillation frequency is set to 1.2MHz or 6MHz can be selected for suiting to your particular application. As for operation mode HiSAT-COT(*) control excellent in transient response , the XC9257 series is PWM control, the XC9258 series is automatic PWM/PFM switching control, allowing fast response, low ripple and high efficiency over the full range of loads (from light load to heavy load).

During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0μA or less. As for the soft-start function as fast as 0.30ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage becomes 1.6V or lower. The B types integrate C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge.

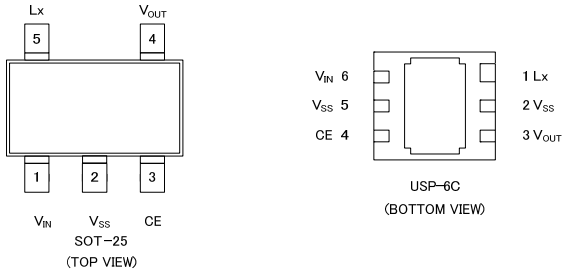
Two types of package SOT-25, USP-6C are available.

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

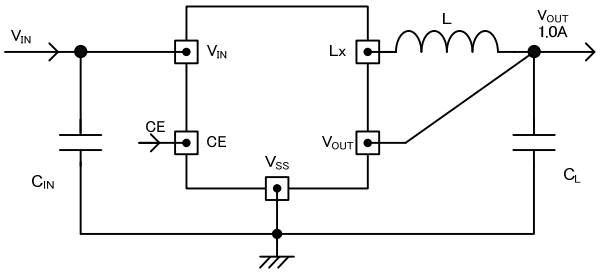
Features

Input Voltage Range: 2.5V～5.5V
Output Voltage Range: 0.8V～3.6V
Oscillation Frequency: 1.2MHz, 6MHz
Output Current: 1A
Control Methods: HiSAT-COT Control
100% Duty Cycle
PWM Control (XC9257)
PWM/PFM Auto (XC9258)
Protection Circuits: Thermal Shutdown
Current Limit (Pendent character)
Short Circuit Protection (Type B)
Functions: Soft-start
UVLO
C_L Discharge (Type B)
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃~ +105℃
Packages: SOT-25,USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

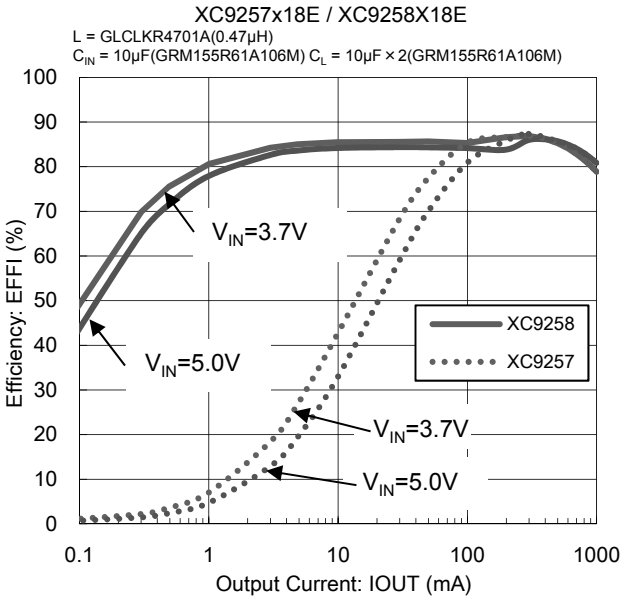
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9257①②③④⑤⑥-⑦ PWM control
XC9258①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to [Selection Guide]
		B	
②③	Output Voltage	08～36	Output voltage options e.g. 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V increments : 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Oscillation Frequency	C	1.2MHz
		E	6MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	C_L AUTO-DISCHARGE	SHORT PROTECTION (LATCH)	UVLO
A	Fixed	No	No	Yes
B	Fixed	Yes	Yes	Yes

TYPE	CHIP ENABLE	CURRENT LIMIT	SOFT-START TIME	THERMAL SHUTDOWN
A	Yes	Yes	Fixed	Yes
B	Yes	Yes	Fixed	Yes

XC9252 Series

Operating Ambient Temperature: +105℃, 30V Operation
Low Quiescent Current Step-down DC/DC Controller IC

RoHS Halogen Antimony FREE

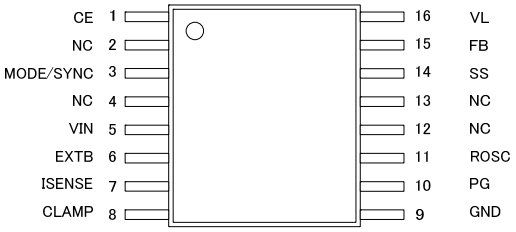
General Description

The XC9252 series is a 30V operation step-down DC/DC controller IC. The external P-ch driver transistor is used to achieve a stable operation under low input voltage. Low ESR capacitors such as ceramic capacitors can be used for the load capacitor (C_L).
A 0.8V reference voltage source is incorporated, and the output voltage can be set freely from 1.0V using external resistors (R_{FB1}, R_{FB2}).
300kHz to 600kHz can be selected for the switching frequency by connecting an external resistor to the ROSC pin. The generation of unneeded noise can be reduced by this synchronization with an external CLK within ±25% of the internal clock using the MODE/SYNC pin. In automatic PWM/PFM control, the IC operates by PFM control when the load is light to achieve high efficiency over the full load range from light to heavy.
The soft start time can be set as desired by adding an external capacitance to the SS pin.
With the built-in UVLO function, the driver transistor is forced OFF when input voltage becomes 2.5V or lower.
Internal protection circuits include over current protection, short-circuit protection, and thermal shutdown circuits to enable safe use.

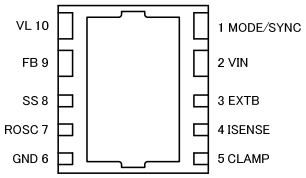
Features

Input Voltage Range: 3.0V～30.0V
(Absolute Max. Rating: 36.0V)
Output Voltage Range: 1.5V～Externally Set
(V_{FB}=0.8V±2.0%)
Quiescent Current: 30μA (@300kHz)
Oscillation Frequency: 280kHz～550kHz (External Resistor)
Synchronous External Clocking: ±25% of the internal clock
Control Method: PWM control (MODE:H)
PWM/PFM (MODE:L)
Soft-start: External set (External C)
Protection Circuits: Over current limit (External Resistor)
Automatic Return (XC9252A/B)
Integral latch protection (XC9252C)
Thermal shutdown
Output Capacitor: Low ESR Capacitor
Operating Ambient Temperature: -40℃～+105℃
Packages: TSSOP-16 (XC9252A/C)
USP-10B (XC9252B)
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

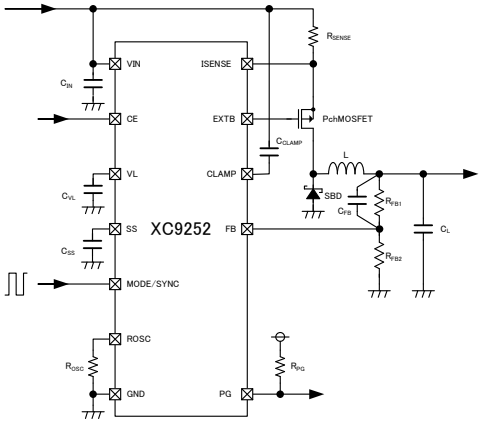


TSSOP-16
(TOP VIEW)



USP-10B
(BOTTOM VIEW)

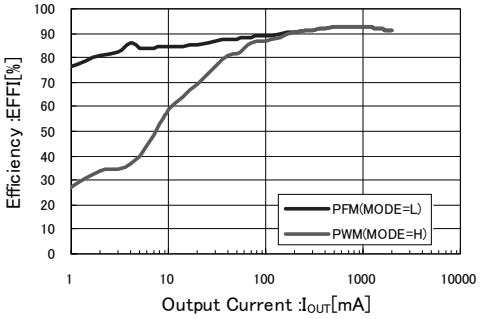
Typical Application Circuit



Typical Performance Characteristics

XC9252x08A(V_{IN}=12V, V_{OUT}=5.7V, f_{OSC}=280kHz)

L=22μH(CLF12555-220M), C_{IN}=10μF(GRM32ER71H106KA12L),
R_{OSC}=300kΩ, C_L=22μF×2(GRM32ER71E226KE15L),
R_{SENSE}=50mΩ, PchMOSFET:2SJ668, SBD:CMS15



Ordering Information

XC9252①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Standard Type (TSSOP-16)
		B	Without Chip Enable, Power-Good (USP-10B)
		C	Standard Type with Latch Protection (TSSOP-16)
②③	FB Voltage	08	FB Voltage 0.8V
④	Oscillation Frequency	A	Adjustable
⑤⑥-⑦ (*1)	Packages (Order Unit)	VR-G	TSSOP-16 (3,000pcs/Reel) * Only Type A, C
		DR-G	USP-10B (3,000pcs/Reel) (*2)* Only Type B

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) The USP-10B reels are shipped in a moisture-proof packing.

*GreenOperation-compatible

XC9248 Series

2.2A 18V Driver Transistor Built-in Synchronous Step-Down DC/DC Converter

RoHS Compliant, Halogen Antimony FREE

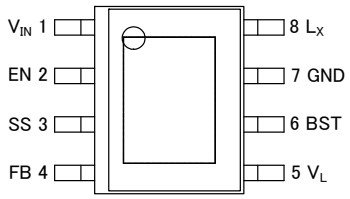
General Description

The XC9248 series is 18V bootstrap synchronous step-down DC/DC converter with built-in Nch-Nch driver transistors.
With an input voltage range from 4.5V to 18V and a maximum output current of 2.2A, the series is suitable for digital home appliance power supplies and can be used with small ceramic capacitors.
The series has a 0.8V reference voltage, and using externally connected resistors, the output voltage can be set freely from 1.0V to 12V.
The control method is synchronous PWM (Source/ Sink). The soft start time is internally set to 2.8ms (TYP.), also can be adjusted using external capacitor.
With UVLO (Under Voltage Lock Out) function, the internal driver transistors are forced OFF when input voltage falls down below 3.8V (TYP.).
The series includes over current protection, V_{OUT} short-circuit protection, Lx short-circuit protection, V_{OUT} overvoltage protection and thermal shutdown.

Features

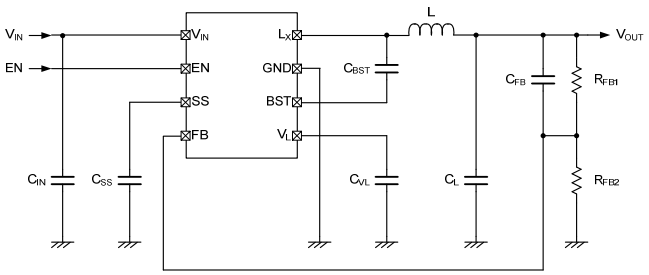
Input Voltage: 4.5V ～ 18.0V
(Absolute Max. Rating: 20.0V)
Output Voltage: 1.0V～12.0V (V_{FB}=0.8V±1.5%) (*1)
Output Current: 2.2A
Efficiency: 93.8% (*1) @V_{IN}=12V, V_{OUT}=5V, I_{OUT}=700mA
Oscillation Frequency: 500kHz
Max. Duty Cycle: 79%
Soft-Start Time: Fixed 2.8ms, set by external capacitor
Protection Circuit: UVLO
High side over current protection
Low side over current protection
V_{OUT} Short-Circuit Protection
L_X Short-Circuit Protection
V_{OUT} Over voltage protection
Thermal shutdown
Package: SOP-8FD
Environmentally Friendly : EU RoHS Compliant, Pb Free
(*1) Performance depends on external components and wiring on the PCB.

Pin Configuration

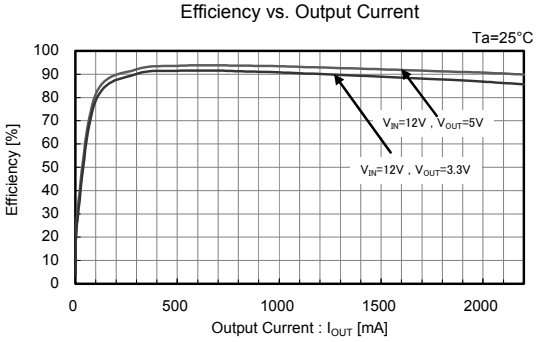


SOP-8FD
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9248①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to [Selection Guide]
		B	
②③	FB Voltage	08	FB voltage is fixed in 0.8V
④	Oscillation Frequency	5	500kHz
⑤⑥-⑦(*1)	Package (Order Unit)	QR-G	SOP-8FD (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

Selection Guide

TYPE	CURRENT LIMITER	LATCH FOR CURRENT LIMITER	LATCH FOR V_{OUT}-SHORT	LATCH FOR L_X-SHORT (*2)	ENABLE	UVLO	C_L AUTO-DISCHARGE	THERMAL SHUTDOWN
A	YES	YES (*1)	YES	YES	YES	YES	YES	YES
B	YES	NO	NO	YES	YES	YES	YES	YES

(*1) The over-current protection latch is an integral latch type.
(*2) To prevent an extremely large rush current from flowing in the event that Lx is short-circuited, both the A & B types have an Lx short protection latch function.

XC9244/XC9245 Series

400mA Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

The XC9244/XC9245 series is a group of synchronous-rectification type step-down DC/DC converters with a built-in 0.65Ω P-ch MOS driver transistor and 0.45Ω N-ch MOS switching transistor, designed to allow the use of ceramic capacitors. Output current of 400mA (MAX.) to be configured using only a coil and capacitor connected externally.

The output voltage can be set from 0.8V to 4.0V in increments of 0.05V (±2.0%). With an internal switching frequency of 1.2MHz, small external components can be used. USPN-6 package is suitable for the application which requires low profile and small-footprint.

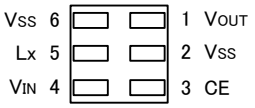
The XC9244 series is PWM fixed frequency control, and the XC9245 series is PWM/PFM, which automatically switches from PWM to PFM during light loads, high efficiency can be achieved over a wide range of load conditions. When stand-by mode, due to stop all operation, quiescent current is reduced to 1μA or less. The integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the V_{OUT} and V_{SS} pins. The C_L discharge function prevents malfunction on V_{OUT} connecting application during stand-by mode.

The XC9244/XC9245 series has a high speed soft-start as fast as 0.25ms in typical for quick turn-on. Current limiter circuit (Constant Current & Latching) is built-in for preventing from thermal destruction. With UVLO (Under Voltage Lock Out) function, the internal P channel driver transistor is forced OFF when input voltage becomes 2.25V or lower.

Features

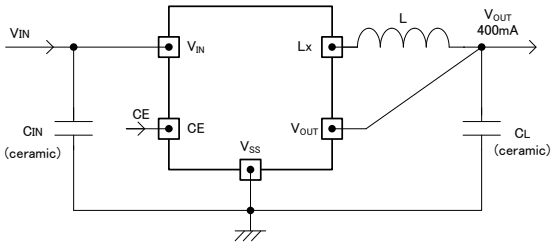
Driver Transistor: 0.65Ω P-ch Driver Transistor
0.45Ω N-ch Synchronous Switch Transistor
Input Voltage: 2.3V ~ 6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Selectable: 0.8V ~ 4.0V (0.05V increments)
High Efficiency: 90% (V_{IN}=4.2V, V_{OUT}=1.8V)
Output Current: 400mA
Oscillation Frequency: 1.2MHz (±15%)
Max. Duty Cycle: 100%
Functions: Current Limiter Circuit (Constant Current & Latching)
C_L High Speed Discharge
Soft Start Circuit
Output Capacitor: Low ESR Ceramic Capacitor
Control Methods: PWM (XC9244)
PWM/PFM Auto (XC9245)
Operating Ambient Temperature: -40°C ~ +85°C
Package: USPN-6
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



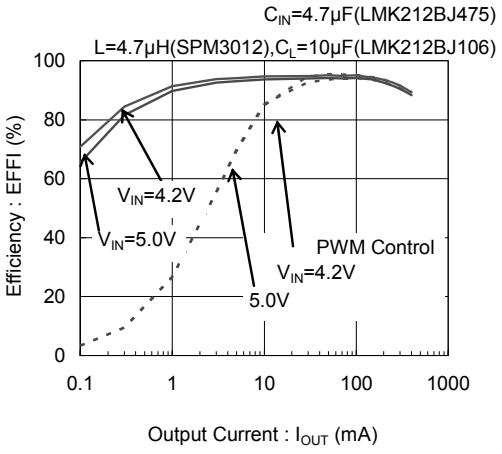
USPN-6
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XC9244/XC9245A33C



Ordering Information

XC9244①②③④⑤⑥-⑦: Fixed PWM control
XC9245①②③④⑤⑥-⑦: PWM / PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	With C_L Auto Discharge
②③	Output Voltage	08～40	Output voltage options e.g. 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V increments: 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M Refer to "Stadard Voltage" Table
④	Oscillation Frequency	C	1.2MHz
⑤⑥-⑦(*1)	Package (Order Unit)	7R-G	USPN-6 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

Standard Voltage

$V_{OUT(V)}$	PRODUCT NAME	
	Fixed PWM	PWM/PFM Auto
1.0V	XC9244A10C7R-G	XC9245A10C7R-G
1.2V	XC9244A12C7R-G	XC9245A12C7R-G
1.5V	XC9244A15C7R-G	XC9245A15C7R-G
1.8V	XC9244A18C7R-G	XC9245A18C7R-G
2.5V	XC9244A25C7R-G	XC9245A25C7R-G
2.8V	XC9244A28C7R-G	XC9245A28C7R-G
3.3V	XC9244A33C7R-G	XC9245A33C7R-G

*For other voltages, please contact your local Torex sales office or representative.

*GreenOperation-compatible

XC9242/XC9243 Series

2A Synchronous Step-Down DC/DC Converters

RoHS Halogen Antimony FREE

General Description

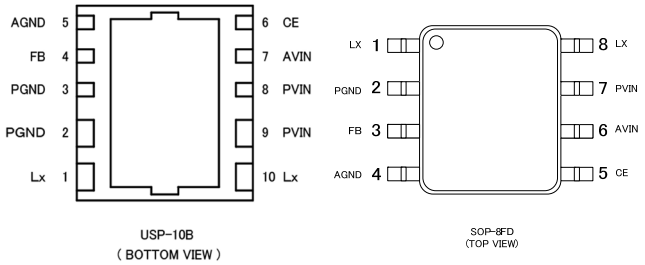
The XC9242/XC9243 series is a group of synchronous-rectification step-down DC/DC converters with a built-in 0.11Ω(TYP.) P-ch MOS driver transistor and 0.12Ω(TYP.) N-ch MOS switching transistor, designed to allow the use of ceramic capacitors. The small on-resistances of these two internal driver transistors enable a high efficiency, stable power supply with an output current up to 2A. The XC9242/XC9243 series has operating voltage range of 2.7V~6.0V and a 0.8V (±2.0%) reference voltage, and using externally connected resistors, the output voltage can be set freely from 0.9V. With an internal switching frequency of 1.2MHz or 2.4MHz, small external components can be used.

The XC9242 series is PWM control, and the XC9243 series is PWM/PFM, which automatically switches from PWM to PFM during light loads and provides high efficiency, high load response, low voltage ripple, can be achieved over a wide range of load conditions. The series have a high speed soft-start as fast as 1ms in typical for quick turn-on. It's suitable for large-current application due to limit current is configured 4.0A in typical. During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0μA or less. The integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the L_X and V_{SS} pins. Due to C_L discharge function, malfunction on L_X is prevented when Stand-by mode. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.5V or lower. The series are available in USP-10B and SOP-8FD packages.

Features

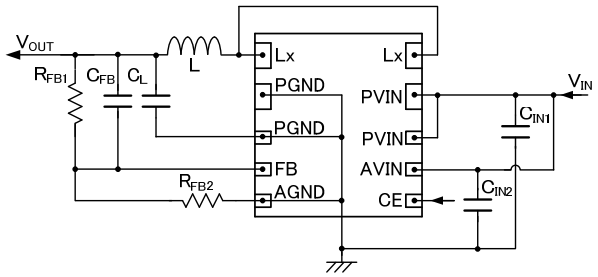
Driver Transistor:	0.11Ω P-ch Driver Transistor 0.12Ω N-ch Switching Transistor
Input Voltage Range:	2.7V ~ 6.0V (Absolute Max. Rating: 7.0V)
Output Voltage Setting:	0.9V ~ V_{IN}
FB Voltage:	0.8V±2.0%
High Efficiency:	95% (V_{IN}=5.0V, V_{OUT}=3.3V)
Output Current:	2.0A
Oscillation Frequency:	1.2MHz (±15%), 2.4MHz (±15%)
Max. Duty Cycle:	100%
Functions:	Soft-Start Circuit Built-in C_L Discharge Current Limit Circuit (automatic return) Thermal Shutdown UVLO
Output Capacitor:	Low ESR Ceramic Capacitor
Control Methods:	PWM (XC9242) PWM/PFM Auto (XC9243)
Operating Ambient Temperature:	-40°C ~ +85°C
Packages:	USP-10B, SOP-8FD
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



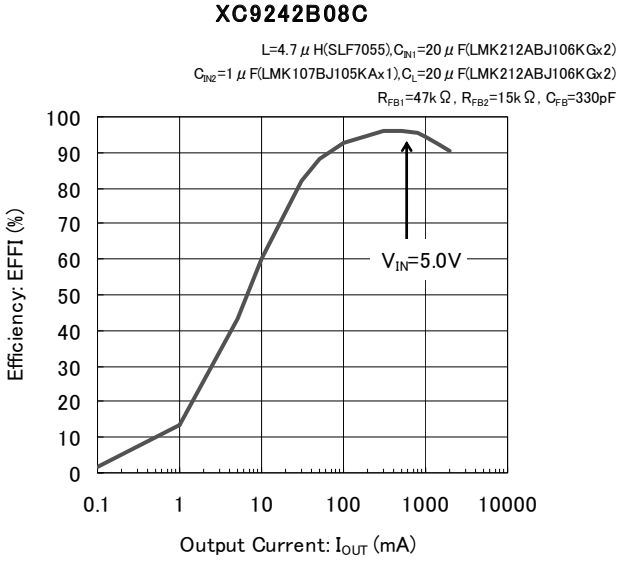
Typical Application Circuit

XC9242/XC9243 Series (USP-10B)



Typical Performance Characteristics

Efficiency vs. Output Current (fosc=1.2MHz, V_{OUT}=3.3V)



Ordering Information

XC9242①②③④⑤⑥-⑦: Fixed PWM control
XC9243①②③④⑤⑥-⑦: PWM / PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Functional Selection	B	With C_L Discharge
②③	Output Voltage	08	Reference Voltage is fixed at 0.8V
④	Oscillation Frequency	C	1.2MHz
		D	2.4MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	DR-G	USP-10B (3,000pcs/Reel)(*2)
		QR-G	SOP-8FD (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

(*2) USP-10B reels are shipped in a moisture-proof packing.

XC9220/XC9221 Series

16V Input Voltage, Step-Down DC/DC Controller IC

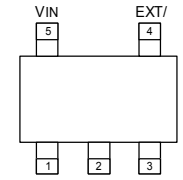
General Description

The XC9220/XC9221 series is a group of multi-purpose step-down DC/DC controller ICs. The ICs enable a high efficiency, stable power supply with an output current up to 3A to be configured using only a transistor, a coil, a diode, and two capacitors connected externally. Low ESR capacitors such as a ceramic capacitor can be used as an output capacitor.
The XC9220/XC9221 series has a 0.9V (±1.5%) reference voltage, and using externally connected resistors, the output voltage can be set freely. With an internal switching frequency of 300kHz and 500kHz 1MHz, small external components can also be used. The XC9220 series is PWM control, and the XC9221 series is PWM/PFM mode, which automatically switches from PWM to PFM during light loads and high efficiencies can be achieved over a wide range of load conditions. As for the soft-start time, the XC9220/9221A and C series is internally set to 4msec and the XC9220/9221B and D series can be externally set-up. With the built-in UVLO (Under Voltage Lock Out) function, the external P-channel driver transistor is forced OFF when input voltage becomes 2.3V or lower. Two types of package, SOT-25 and USP-6, are available.

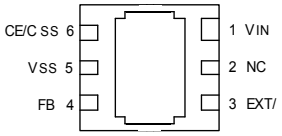
Features

Operating Voltage Range: 2.8V ~ 16.0V
(Absolute Max. Rating: 18.0V)
FB Voltage: 1.2V or more, Externally Set
(V_{FB}=0.9V ±1.5%)
Oscillation Frequency: 300kHz, 500kHz, and 1.0MHz
Control Methods: PWM control (XC9220)
PWM/PFM (XC9221)
Soft-start: 4ms, (Types A, C)
Externally set (Types B, D)
Protection Circuits: Integral protection (1.0 ms)
(Types A, B)
Short Circuit Protection
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

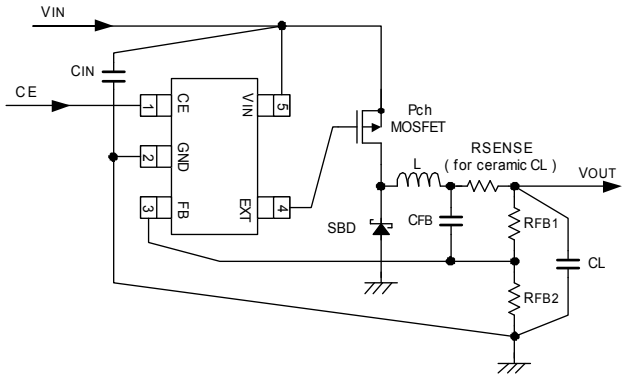


SOT-25 (TOP VIEW)



USP-6C (BOTTOM VIEW)

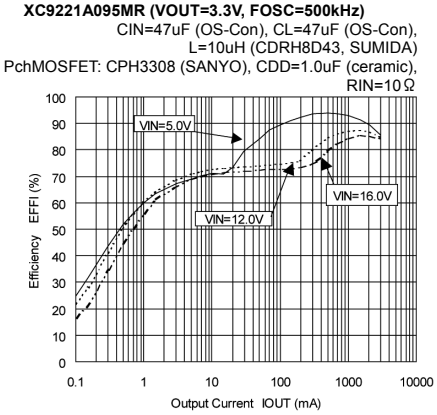
Typical Application Circuit



* RSENSE : Tantalum and electrolytic capacitors can be used, in which case, RSENSE becomes unnecessary.

Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9220①②③④⑤⑥-⑦ : Fixed PWM control
XC9221①②③④⑤⑥-⑦ : PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller ICs	A	Soft-start internally set with integral protection function
		B	Soft-start externally set with integral protection function
		C	Soft-start internally set without integral protection function
		D (The Recommended Type)	Soft-start externally set without integral protection function
②③	Output Voltage	09	FB Voltage (Fixed)
④	Oscillation Frequency	3	300kHz
		5	500kHz
		A	1MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

*GreenOperation-compatible

XC9213 Series

25V Input Synchronous Step-Down DC/DC Controller IC

RoHS Compliant, Halogen Antimony FREE

General Description

XC9213 series is N-ch & N-ch drive, synchronous, step-down DC/DC controller IC with a built-in bootstrap driver circuit. Output will be stable no matter which load capacitors, including a low ESR capacitor, are used.

Resistance (RSENSE) of about several 10mΩ will be required as a current sense. The phase compensation is also run when a low ESR capacitor is used. In addition, the circuit is double protected by the ways of limiting the current while detecting overshoot current and making output shutdown at any given timing by a protection time setting capacitor (CPRO).

The output voltage can be set freely within a range of 1.5V ~ 15V with 1.0V (±2.0%) of internal reference voltage by using externally connected resistors (RFB1, 2). Synchronous rectification PWM control can be switched to non-synchronous 30mV current limit PFM/PWM automatic switchable control (=voltage between RSENSE pins) by using the MODE pin.

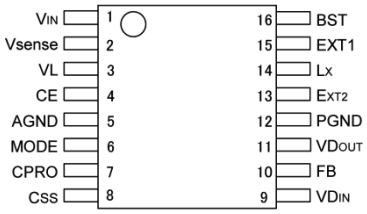
The series has a built-in voltage detector for monitoring a selected voltage by external resistors.

During stand-by (CE pin = low), all circuits are shutdown to reduce current consumption to as low as 4.0μA or less.

Features

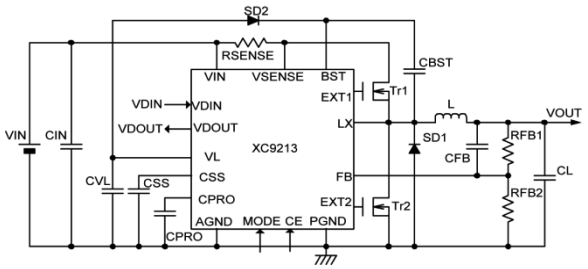
Input Voltage Range: 4.0V ~ 25.0V
(Absolute Max. Rating: 30.0V)
Output Voltage Range: 1.5V ~ 15V externally set
Reference voltage 1.0V ±2.0%
Output Current: More than 5.0A (VIN=5.0V, VOUT=3.3V)
Oscillation Frequency: 300kHz ±15%
Control: PWM / PFM manual-switching control
Current Limiter, protection:
Current limit operates at voltage sense 170mV
Shutdown time can be adjustable by CPRO.
High Efficiency: 93% (TYP. PWM mode @ VIN=5.0V, VOUT=3.3V, 1A)
Detect Voltage Function: Detects 0.9V / Open-drain output
Stand-by Current: 4.0μA (MAX.)
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C ~ +85°C
Package: TSSOP-16
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



TSSOP-16
(TOP VIEW)

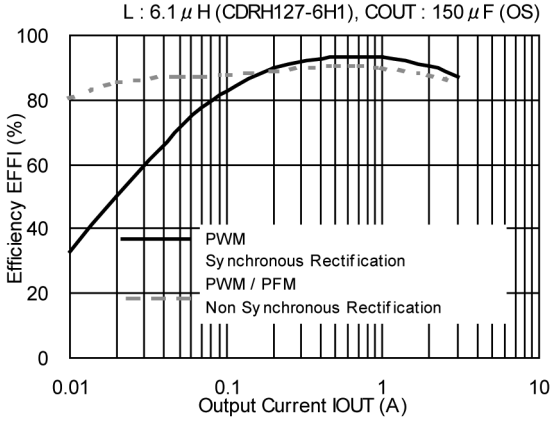
Typical Application Circuit



Typical Performance Characteristics

XC9213B103V (FOSC:300kHz,3.0V)

VIN : 5.0V, Tr1,Tr2: IRF7313,
L : 6.1μH (CDRH127-6H1), COUT : 150μF (OS)



Ordering Information

XC9213B①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Reference Voltage	10	1.0V (±2.0%)
③	Oscillation Frequency	3	300kHz
④⑤-⑥(*1)	Package (Order Unit)	VR-G	TSSOP-16 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XCM526 Series

3A Step-Down DC/DC Converter with 16V Input

General Description

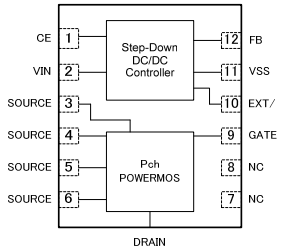
The XCM526 series is a multi-module IC which includes a step-down DC/DC controller IC and P-channel power MOSFET. The IC enables a high efficiency, stable power supply with an output current up to 3A. Low ESR electrolytic capacitors such as an OS-CON aluminum solid capacitor, a tantalum Neo capacitor can be used as an output capacitor. In case of using a ceramic capacitor, RSENSE is needed to be placed on.

The XCM526 series has a 0.9V (±1.5%) reference voltage, and using externally connected resistors, the output voltage can be set freely. With an internal switching frequency of 500kHz and 1.0MHz, small external components can also be used. The XCM526A has a fixed PWM control for low output voltage ripple, and the XCM526B has a PWM/PFM control, which automatically switches from PWM to PFM during light loads and high efficiencies can be achieved over a wide range of load conditions. As for the soft-start time, there are two types, one is internally set to 4ms and the other can be externally set-up. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.3V (TYP.) or lower.

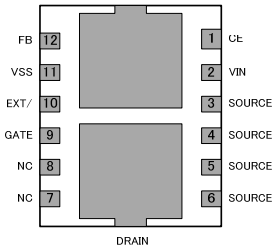
Features

<DC/DC Block>
Input Voltage Range: 4.0V ~ 16.0V (Absolute Max. Rating: 18.0V)
Output Voltage Externally Set Range: 1.2V ~ (0.9V±1.5%)
Max. Output Current: 3.0A
Oscillation Frequency: 500kHz、1MHz
Control: PWM control (XCM526A)
PWM/PFM automatic switching (XCM526B)
Soft-Start: 4ms internally fixed and externally set
Protection Circuits: Short Circuit Protection
<Power MOSFET Block>
ON Resistance: 70mΩ (V_{GS}=-4.5V),
47mΩ (V_{GS}=-10.0V)
Operating Ambient Temperature: -40°C ~ +85°C
Package: USP-12B01 (2.3mm x 2.8mm)
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

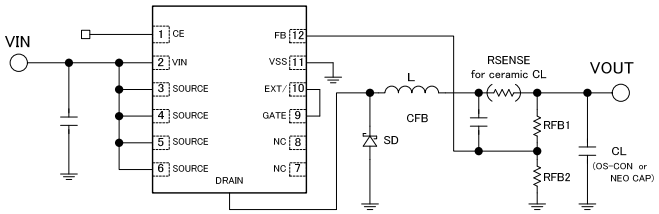


USP-12B01
(TOP VIEW)



USP-12B01
(BOTTOM VIEW)

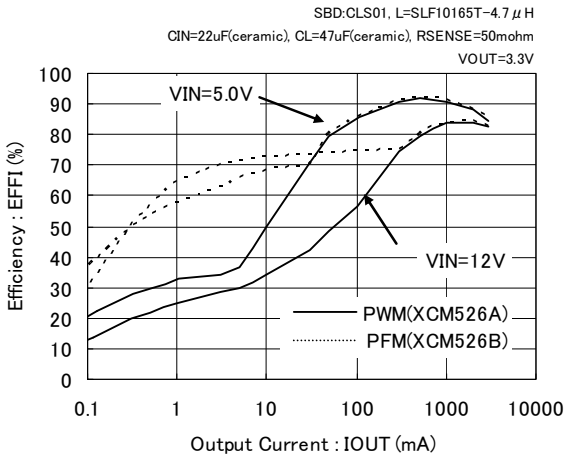
Typical Application Circuit



(TOP VIEW)

Typical Performance Characteristics

XCM526Ax/Bx9Axx



Ordering Information

XCM526A①②③④⑤-⑥…PWM control
XCM526B①②③④⑤-⑥…PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	C	Soft-start internally fixed
		D	Soft-start externally set
②	Output Voltage	9	FB Standard Voltage 0.9V±1.5%
③	Oscillation Frequency (*2)	5	500kHz
		A	1.0MHz
④⑤-⑥(*1)	Package (Order Unit)	DR-G	USP-12B01 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For the 300kHz type is semi-custom product. Please contact your local Torex sales office or representative.

XC9141/XC9142 Series

Load Disconnection Function, 0.8A Step-Up DC/DC Converters

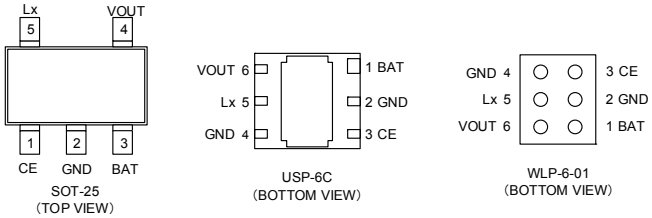
General Description

XC9141/XC9142 series are synchronous step-up DC/DC converters with a 0.3Ω(TYP.) N-channel driver transistor and a 0.4Ω(TYP.) synchronous P-channel switching transistor built-in. A highly efficient and stable current can be supplied up to 0.8A by reducing ON resistance of the built-in transistors.
The series are able to start operation under the condition which has 0.9V input voltage (V_{BAT}) to generate 3.3V output voltage with a 100Ωload resistor, suitable for mobile equipment using only one Alkaline battery or one Nickel metal hydride battery.
The output voltage can be set from 1.8V to 5.5V (±2.0%) in steps of 0.1V.With the built-in oscillator, either 1.2MHz or 3.0MHz can be selected for suiting to your particular application.
During the devices enter stand-by mode, A, D type prevent the application malfunction by C_L Discharge Function which can quickly discharge the electric charge at the output capacitor (C_L). B, E type is able to drive RTC etc. by Bypass Switch Function to maintain continuity between the input and output. C, F type is able to connect in parallel with other power supplies by Load Disconnection Function which breaks continuity between the input and output.
* Type D, E, and F are under development.

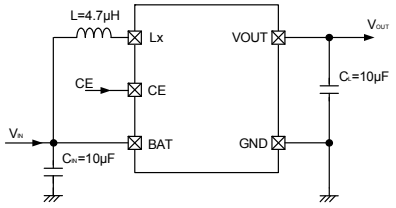
Features

Input Voltage Range: 0.65V～6.0V (Absolute Max. Rating: 7.0V)
Fixed Output Voltages: 1.8V～5.5V (0.1V increments Type A, B, C)
2.2V～2.5V (Type D, E, F)
Oscillation Frequency: 1.2MHz (±15%),3MHz (±20%)
Input Current: 0.8A
Output Current: 500mA @V_{OUT}=5.0V, V_{BAT}=3.3V (TYP.)
350mA @V_{OUT}=3.3V, V_{BAT}=1.8V (TYP.)
Control Mode Selection: PWM (XC9141 Series) or
Auto PWM/PFM (XC9142 Series)
Load Transient Response: 100mV
@V_{OUT}=3.3V,V_{BAT}=1.8V,V_{OUT}=1mA→200mA (tr=5μs)
Protection Circuits: Over-current limit
Integral latch method (Type D,E,F)
Output short-circuit protection (Type D,E,F)
Functions: Soft-start
Load Disconnection Function (Type A,C,D,F)
C_L Auto Discharge Function (Type A,D)
Bypass Switch Function (Type B,E)
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+85℃
Packages: SOT-25, USP-6C, WLP-6-01
Environmentally Friendly: EU RoHS Compliant, Pb Free
* Type D, E and F are under development.

Pin Configuration

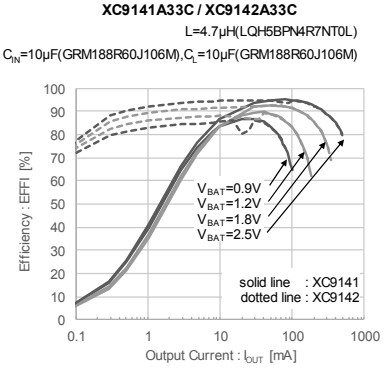


Typical Application Circuit



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9141①②③④⑤⑥-⑦ PWM control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to Selection Guide
		B	
		D(*2)	
		E(*2)	
②③	Output Voltage (XC9141A,B Type)	18～55	Output voltage options e.g. 1.8V → ②=1, ③=8
	Output Voltage (XC9141D,E Type)	22～55	Output voltage options e.g. 2.2V → ②=2, ③=2
④	Oscillation Frequency	C	1.2MHz
		D	3.0MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)
		0R-G	WLP-6-01 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.
(*2) Type D and E are under development.

XC9142①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to Selection Guide
		B	
		C	
		D(*2)	
		E(*2)	
		F(*2)	
②③	Output Voltage (XC9142A,B,C Type)	18～55	Output voltage options e.g. 1.8V → ②=1, ③=8
	Output Voltage (XC9142D,E,F Type)	22～55	Output voltage options e.g. 2.2V → ②=2, ③=2
④	Oscillation Frequency	C	1.2MHz
		D	3.0MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)
		0R-G	WLP-6-01 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.
(*2) Type D, E, and F are under development.

●Selection Guide

TYPE	OUTPUT VOLTAGE	CHIP ENABLE	SOFT-START	CURRENT LIMIT	SHORT PROTECTION WITH LATCH	C_L AUTO-DISCHARGE	SHUTDOWN OPTIONS AT CE=L
A	Fixed	Yes	Fixed	Yes (without latch)	No	Yes	Complete Output Disconnect(*2)
B	Fixed	Yes	Fixed	Yes (without latch)	No	No	Input-to-Output Bypass(*2)
C(*1)	Fixed	Yes	Fixed	Yes (without latch)	No	No	Complete Output Disconnect(*3)
D(*4)	Fixed	Yes	Fixed	Yes (with integral latch)	Yes	Yes	Complete Output Disconnect(*2)
E(*4)	Fixed	Yes	Fixed	Yes (with integral latch)	Yes	No	Input-to-Output Bypass(*2)
F(*1)(*4)	Fixed	Yes	Fixed	Yes (with integral latch)	Yes	No	Complete Output Disconnect(*3)

(*1) Type C, F is available for the XC9142 series only.
(*2) V_{OUT} pin can not be connected to the different output pin such as another supply (AC adaptor).
(*3) V_{OUT} pin can be connected to the different output pin such as another supply (AC adaptor).
(*4) Type D, E, and F are under development.

XC9140 Series

PFM Control, Step-Up Synchronous DC/DC Converter

General Description

The XC9140 series are step-up synchronous DC/DC converters that support ceramic capacitors and have an internal 0.6Ω (TYP.) Nch driver transistor and an internal 0.65Ω (TYP.) Pch synchronous rectifier switch transistor. PFM control enables a low quiescent current, making these products ideal for portable devices that require high efficiency.

When the output voltage is 3.3V and the output current is 1mA, startup from an input voltage of V_{BAT}=0.9V is possible which means that the XC9140 can be used in applications that start from a single alkaline or nickel-metal hydride battery. The output voltage can be set from 1.8V to 5.0V (±2.0%) in steps of 0.1V.

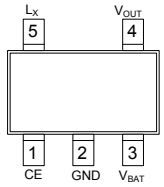
The XC9140 features a load disconnect function to break continuity between the input and output at shutdown (XC9140A), and also a bypass mode function to maintain continuity between the input and output (XC9140C).

A version with a UVLO (Under Voltage Lock Out) function will also be available (currently under development) which enables the prevention of battery leakage by stopping the IC's operation when the input voltage is low. The standard product will have a UVLO release voltage of 2.15V (±3.0%) and a custom version with a UVLO release voltage selectable from between 1.65V to 2.2V, in steps of 0.05V, will also be made available.

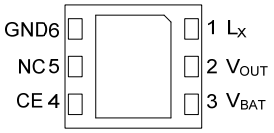
Features

High Efficiency Step-up DC/DC Converter at light load
Efficiency 80% @V_{OUT}=3.3V, V_{BAT}=1.8V, I_{OUT}=100μA
Input Voltage Range: 0.9V~5.5V (Absolute Max. Rating: 7.0V)
Output Voltage Setting: 1.8V~5.0V (±2.0%) 0.1V increments
Output Current: 100mA@V_{OUT}=3.3V, V_{BAT}=1.8V (TYP.)
Driver Transistor: 0.6Ω Nch driver transistor
0.65Ω Pch synchronous rectifier switch transistor
Quiescent Current: 6.3μA (V_{BAT}=V_{OUT}+0.5V)
Control Method: PFM Control
High Speed Transient Response: 50mV@V_{OUT}=3.3V, V_{BAT}=1.8V, I_{OUT}=1→50mA
PFM Switching Current: 350mA
Functions: Load Disconnection Function or Bypass Mode Function
UVLO
Inrush Current Protection
Ceramic Capacitor
Operating Ambient Temperature: -40℃～+85℃
Packages: SOT-25, USP-6EL
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

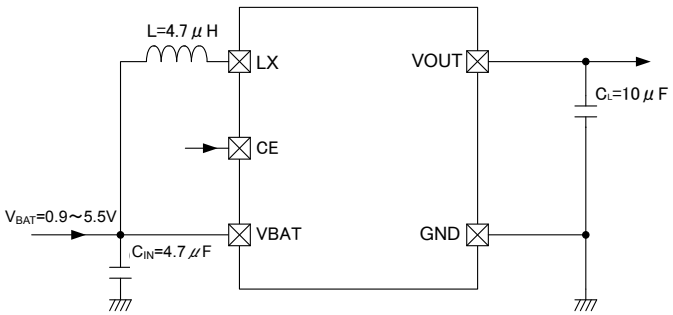


SOT-25
(TOP VIEW)

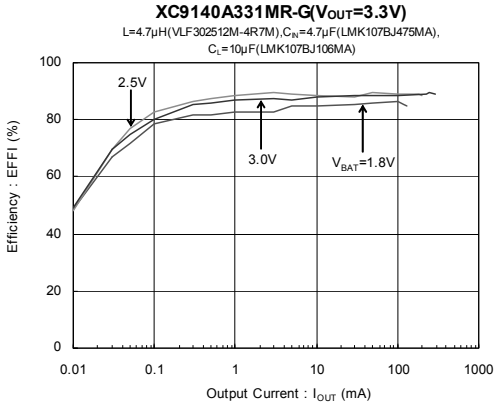


USP-6EL
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9140①②③④⑤⑥-⑦ PFM contrtol

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
① (*1)	Product Type	A	Load Disconnection Without C_L Auto Discharge
		C	V_{BAT} Bypass Without C_L Auto Discharge
②③ (*2)	Output Voltage	18～50	Output Voltage e.g. V_{OUT}=3.3V⇒②=3, ③=3
④	UVLO Function	1	No UVLO
		2	UVLO Function, V_{UVLO_R}=2.15V
⑤⑥-⑦ (*3)	Packages (Order Unit)	4R-G	USP-6EL (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)

(*1) The product with the C_L discharge function is a semi-custom product.

(*2) V_{OUT}=3.3V is standard.

(*3) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

XC9135/XC9136 Series

1A Driver Transistor Built-in, Step-Up DC/DC Converters with Load Disconnection Function (V_{OUT} product)

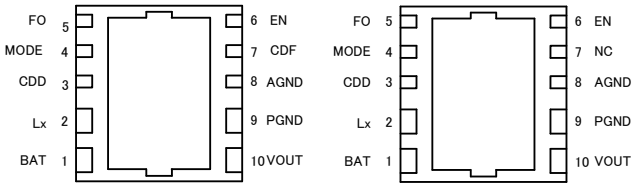
General Description

XC9135/XC9136 series are synchronous step-up DC/DC converters with a 0.2Ω(TYP.) N-ch driver transistor and a 0.2Ω(TYP.) synchronous P-ch switching transistor built-in. A highly efficient and stable current can be supplied up to 1.0A by reducing ON resistance of the built-in transistors.
The series are able to start operation under the condition which has 0.9V input voltage to generate 3.3V output voltage with a 33Ω load resistor, suitable for mobile equipment using only one Alkaline battery or one Nickel metal hydride battery.
During the operation of a shutdown, the load disconnection function enables to cut the current conduction path from the input to the output.
The fixed output voltage has 1.8~5.0V (±2.0% accuracy) output voltage range with 0.1V increments. The UVLO function of the XC9135 series is capable to reduce leaking potassium hydroxide by stopping IC operation while battery voltage is declining. The release voltages of UVLO are 0.85V (±6.0% accuracy) and 1.6V (±3.0% accuracy), and selectable voltages range of 0.9V~3.0V.

Features

Input Voltage Range: 0.65V ~ 5.5V (Absolute Max. Rating: 7.0V)
Fixed Output Voltages: 1.8V ~ 5.0V (0.1V increments)
Oscillation Frequency: 1.2MHz (±15%)
Input Current: 1.0A
Output Current: 500mA @ V_{OUT}=3.3V, V_{IN}=1.8V(TYP.)
Control: PWM or Auto PWM/PFM
Load Transient Response: 100mV V_{OUT}=3.3V, V_{IN}=1.8V, I_{OUT}=1mA→200mA
Protection Circuits: Thermal shutdown
Over-current limit
Integral latch method
Functions: Soft-start
Load Disconnection Function
C_L Auto Discharge Function
Flag-out Function
UVLO
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40°C ~ +85°C
Package: USP-10B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

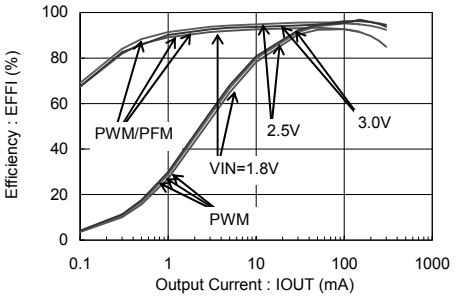


USP-10B
(BOTTOM VIEW)
XC9135 Series

USP-10B
(BOTTOM VIEW)
XC9136 Series

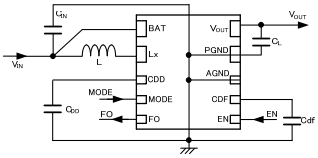
Typical Performance Characteristics

XC9135C32CDR-G (V_{OUT}=3.2V)
L=4.7μH (VLF3014ST-4R7M1R1), C_L=22μF (LMK316ABJ226ML)
C_{IN}=10μF (JMK212ABJ106KG), C_{DD}=0.47μF (TMK107BJ474KA)
f_{OSC}=1.2MHz

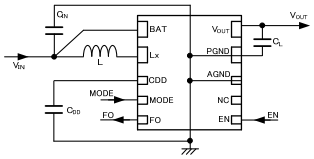


Typical Application Circuits

●XC9135 Series



●XC9136 Series



Ordering Information

XC9135①②③④⑤⑥-⑦·····V_{OUT} product with UVLO integral latch protection
XC9136①②③④⑤⑥-⑦·····V_{OUT} product

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION (*2) (○···With the functions ×···Without the functions)						
			UVLO 0.85V	UVLO 1.6V	UVLO≦1.2 Outside Standard	1.2<UVLO Outside Standard	UVLO DETECT DELAY	LATCH PROTECTION	C_L AUTO DISCHARGE (*3)
①	XC9135 series Output voltage internally fixed(V_{OUT})	A	×	○	×	×	○	○	○
		C	×	○	×	×	○	○	×
		B	○	×	×	×	○	○	○
		K	○	×	×	×	○	○	×
	XC9135 series Semi custom(*5)	L	×	×	×	○	○	○	○
		M	×	×	×	○	○	○	×
		R	×	×	○	×	○	○	○
		T	×	×	○	×	○	○	×
	XC9136 series Output voltage internally fixed(V_{OUT})	E	×	×	×	×	×	×	○
		N	×	×	×	×	×	×	×
②③	Output Voltage (V_{OUT}) (XC9135A,C,B,K/XC9136 Series)	18～50	Output Voltage(*4) e.g.) 1.8V→②=1, ③=8 e.g.) 5.0V→②=5, ③=0						
	Output Voltage (V_{OUT}) (XC9135L,M,R,T Series)	01～99	Semi custom serial numbers starting from 01(*5)						
④	Oscillation Frequency	C	1.2MHz						
⑤⑥-⑦(*1)	Package (Order Unit)	DR-G	USP-10B (3,000pcs/Reel) (*6)						

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.
(*2) The SYMBOL of DESIGNATOR① is decided by the combination of with or without "UVLO", "UVLO DETECT DELAY", "FO", "LATCH PROTECTION", and "C_L DISCHARGE".
Example: ○···With the functions ×···Without the functions
(*3) Example: ○···V_{OUT} pin can not be connected to the different output pin such as another supply (AC adaptor).
×···V_{OUT} pin can be connected to the different output pin such as another supply (AC adaptor).
(*4) The XC9135A, XC9135C, XC9135L, limit their selection rang in 2.8V to 5V. The other products have the range from 1.8V to 5V.
(*5) The XC9135L, XC9135M, XC9135R, XC9135T are semi-custom products. Please consult with your Torex sales contact.
(*6) The XC9135/XC9136 reels are shipped in a moisture-proof packing. Please consult with your Torex sales contact.

XC9131 Series

1A Driver Transistor Built-in, Step-Up DC/DC Converters with Load Disconnection Function (FB product)

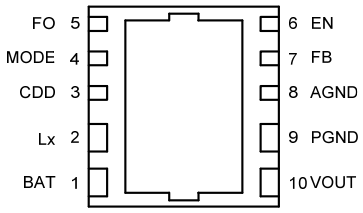
General Description

XC9131 series are synchronous step-up DC/DC converters with a 0.2Ω(TYP.) N-ch driver transistor and a 0.2Ω(TYP.) synchronous P-ch switching transistor built-in. A highly efficient and stable current can be supplied up to 1.0A by reducing ON resistance of the built-in transistors.
The series are able to start operation under the condition which has 0.9V input voltage to generate 3.3V output voltage with a 33Ω load resistor, suitable for mobile equipment using only one Alkaline battery or one Nickel metal hydride battery.
During the operation of a shutdown, the load disconnection function enables to cut the current conduction path from the input to the output.
The XC9131 series has 0.5V±0.01V reference voltage integrated and being able to set an output voltage with external components.

Features

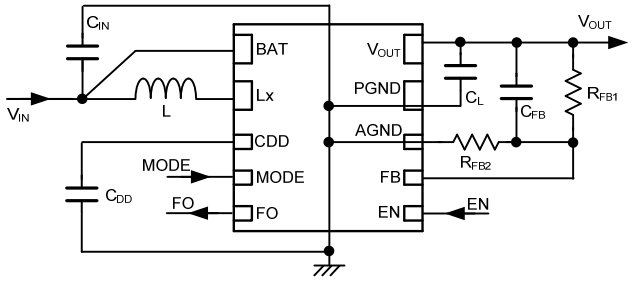
Input Voltage Range: 0.65V~5.5V
(Absolute Max. Rating: 7.0V)
Voltage Adjustable Type: V_{FB}=0.50V±0.01V Set up with external components
Oscillation Frequency: 1.2MHz (±15%)
Input Current: 1.0A
Output Current: 500mA @ V_{OUT}=3.3V, V_{IN}=1.8V(TYP.)
Control Mode Selection: PWM or Auto PWM/PFM
Load Transient Response: 100mV @ V_{OUT}=3.3V,
V_{IN}=1.8V, I_{OUT}=1mA→200mA
Protection Circuits: Thermal shutdown
Over-current limit
Integral latch method
Functions: Soft-start
Load Disconnection Function
C_L Discharge Function
Flag-out Function
Output Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40°C ~ +85°C
Package: USP-10B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

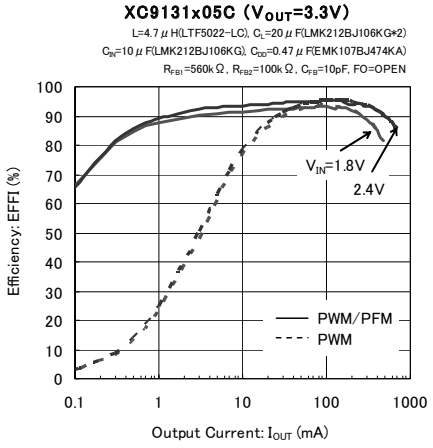


USP-10B
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9131①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	C_L Discharge	F	Available
		H	Not Available
②③	Reference Voltage (FB)	05	0.5V (Fixed)
④	Oscillation Frequency	C	1.2MHz
⑤⑥-⑦(*1)	Package (Order Unit)	DR-G	USP-10B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

*GreenOperation-compatible

XC9128/XC9129 Series

RoHS Compliant, Halogen & Antimony FREE

1A Driver Transistor Built-in, Step-Up DC/DC Converters

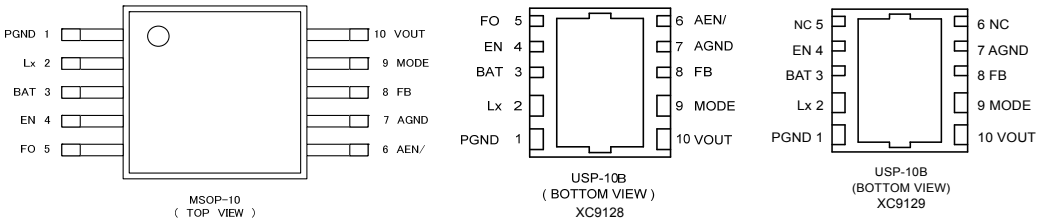
General Description

The XC9128/XC9129 series are synchronous step-up DC/DC converters with a 0.2Ω (TYP.) N-ch driver transistor and a synchronous 0.2Ω (TYP.) P-ch switching transistor built-in. A highly efficient and stable current can be supplied up to 1.0A by reducing ON resistance of the built-in transistor. With a high switching frequency of 1.2MHz, a small inductor is selectable; therefore, the XC9128/XC9129 series are ideally suited for the applications required height limitation or space-saving. With the MODE pin, the XC9128/XC9129 series provide mode selection of PWM control or PFM/PWM automatic switching control. In the PWM/PFM automatic switching mode, the series enters from PWM to PFM to reduce switching loss when load current is small. When load current is large, the series enters automatically to the PWM mode so that high efficiency is achievable over a wide range of load conditions. The series provide small output ripple from light to large loads by using the built-in circuit which enables the transition between PWM and PFM smoothly. When voltage higher than the input voltage is applied to the output during shut-down, the input and the output are isolated and the IC allows parallel drive with such as AC adaptor.

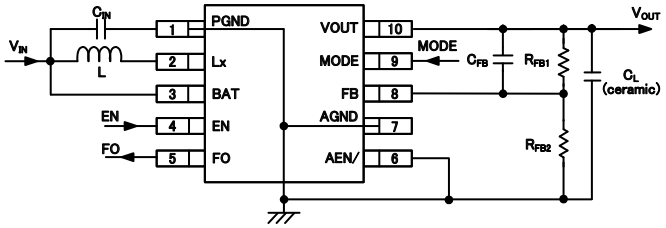
Features

Output Current: 150mA@V_{OUT}=3.3V, V_{IN}=0.9V
500mA@V_{OUT}=3.3V, V_{IN}=1.8V
Input Voltage Range: 0.8V~6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Setting Range:
1.8V~5.3V (Externally set)
Set up freely with a reference voltage supply of 0.45V (±0.010V) & external components
Oscillation Frequency: 1.2MHz (±15%)
Input Current: 1.0A
Max. Current Limit: 1.2A (MIN.), 2.0A (MAX.)
Low Quiescent Current: 30μA (TYP.)
Controls: PWM, PWM/PFM control externally switching
High Speed Transient Response: 100mV @ V_{OUT}=3.3V, V_{IN}=1.8V, I_{OUT}=10mA →100mA
Protection Circuits: Thermal shutdown
Integral latch method (Over current limit)
Soft-start: 5ms (TYP.)
Ceramic Capacitor Compatible
Adaptor Enable Function (XC9128)
Operating Ambient Temperature:
-40°C ~ +85°C
FO (XC9128): Open-drain output
Packages: MSOP-10, USP-10B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

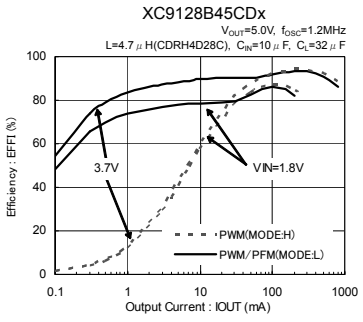


Typical Application Circuit



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9128①②③④⑤⑥-⑦･･･Adaptor Chip Enable Pin and Flag Output Pin are added

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Integral Protection	B	With integral protection
		D	Without integral protection
②③	Fixed Reference Voltage	45	0.45V
④	Oscillation Frequency	C	1.2MHz
⑤⑥-⑦(*1)	Packages (Order Unit)	AR-G	MSOP-10 (1,000pcs/Reel)
		DR-G	USP-10B (3,000pcs/Reel)

XC9129①②③④⑤⑥-⑦･･･Adaptor Chip Enable Pin and Flag Output Pin are not added

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Integral Protection	B	With integral protection (under development)
		D	Without integral protection
②③	Fixed Reference Voltage	45	0.45V
④	Oscillation Frequency	C	1.2MHz
⑤⑥-⑦(*1)	Package (Order Unit)	DR-G	USP-10B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

XC9120/XC9121/XC9122 Series

Step-Up DC/DC Controller IC, Max Duty: 93%

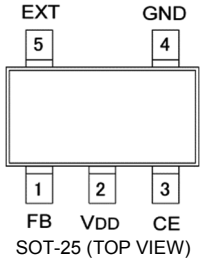
General Description

XC9120/XC9121/XC9122 Series are PWM control step-up DC/DC converter controller ICs. Since maximum duty ratio is as large as 93%, the series is the best for the applications used as high step-up ratios, such as the LCD panels and OELD. In this series, even if it is a high step-up ratio, the output voltage stabilized at high efficiency can be obtained. With 0.9V (±2.0%) of reference voltage supply internal, and using external resistors, RFB1 and 2, output voltage can be set up freely within a range of 1.5V to 30V.
For a current sense, with the use of RSENSE, ceramic capacitors can be used as load capacitors and allows for lower output ripple and reduced PCB area requirements.
During stand-by (when the CE pin is low), all circuits are shutdown to reduce current consumption to as low as 1.0μA or less.
The overcurrent limit circuit of this IC is designed to monitor the ripple voltage of the FB pin and operates the IC to stop when the ripple voltage runs over 250mV. The IC resumes its operation with a toggle of the CE pin or by turning the power supply back on.

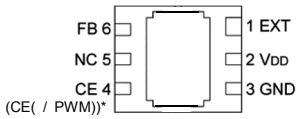
Features

Input Voltage Range: 0.9V~6.0V
(Absolute Max. Rating: 12.0V)
Operating Voltage Range: 1.8V~6.0V
FB Voltage: 0.9V (±2.0%)
Oscillation Frequency: 100kHz (±15%)
Output Current: More than 80mA (V_{IN}=3.6V, V_{OUT}=15V)
Control: XC9120 (PWM Control)
XC9121 (PWM/PFM Automatic Switching Control),
XC9122 (PWM/PFM Externally Switching Control)
High Efficiency: 85% (TYP.)
(V_{IN}=3.6V, V_{OUT}=15V, I_{OUT}=10mA)
Low Quiescent Current: 13μA (TYP.)
Stand-by Current: 1.0μA (MAX.)
Output Capacitor: Low ESR Ceramic
Current Limiter Function: Operates when ripple voltage=250mV
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

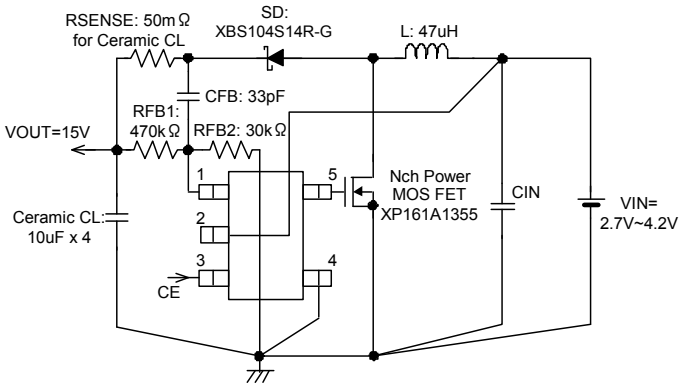


SOT-25 (TOP VIEW)

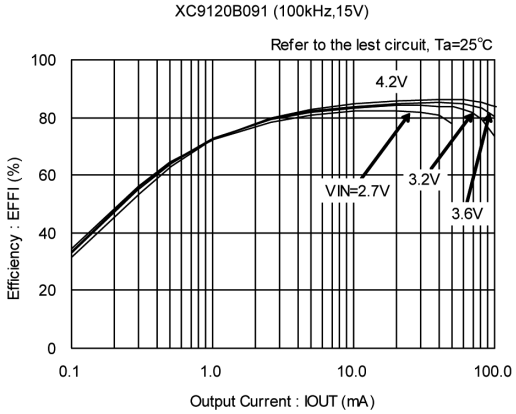


USP-6C (BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9120①②③④⑤⑥-⑦: Fixed PWM control
XC9121①②③④⑤⑥-⑦: PWM / PFM automatic switching control
XC9122①②③④⑤⑥-⑦: PWM / PFM externally switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	B	With current limiter
		D	No current limiter
②③	Output Voltage	09	FB Voltage 0.9V (±2.0%)
④	Oscillation Frequency	1	100kHz
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

*GreenOperation-compatible

XC9119 Series

1MHz, PWM Controlled, Step-Up DC/DC Converter, Ceramic Capacitor Compatible

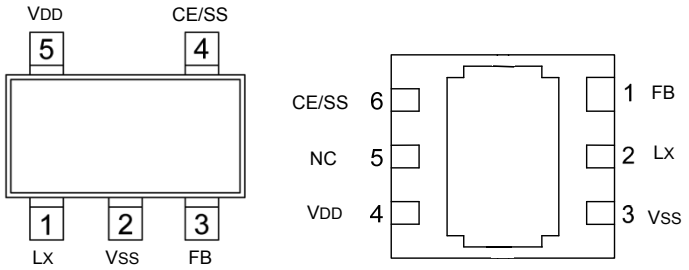
General Description

The XC9119D01A series is 1MHz, PWM controlled step-up DC/DC converter, designed to allow the use of ceramic capacitors. With a built-in 2.0Ω switching transistor, the XC9119D01A series can easily provide a step-up operation by using only a coil, a diode, a capacitor, and a resistor, connected externally.
Since output voltage up to 19.5V (Max. Lx operating voltage: 20V) can be derived with reference voltage supply of 1.0V (±2.0%) and external components, the series can easily supply high voltage for various general-purpose power supplies, LCD panels and organic EL displays.
With a high switching frequency of 1.0MHz, a low profile and small board area solution can be achieved using a chip coil and an ultra small ceramic output capacitor.
With the current limit function (400mA (TYP.): VDD=3.6V), a peak current, which flows through built-in driver transistors can be limited. Soft-start time can be adjusted by external resistors and capacitors. The stand-by function enables the output to be turned off (CE 'L'), that is, the quiescent current will be less than 1.0μA.

Features

Operating Voltage Range: 2.5V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Output Voltage Range: Up to 19.5V externally set-up
Oscillation Frequency: 1.0MHz (±20%)
ON Resistance: 2.0Ω (VDD: 3.6V, VDS: 0.4V)
Efficiency: 86% (VOUT=15V, VDD=3.6V, IOUT=10mA)
Low Quiescent Current: 55μA (TYP.)
Control: PWM control
Stand-by Current: 1.0μA (MAX.)
Output Capacitor: Low ESR Ceramic
Lx Limit Current: 400mA (VDD:3.6V)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

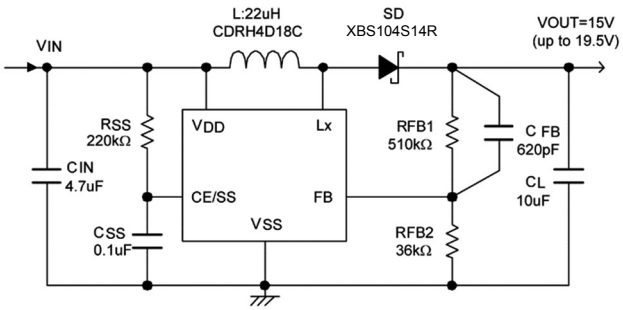
Pin Configuration



SOT-25
(TOP VIEW)

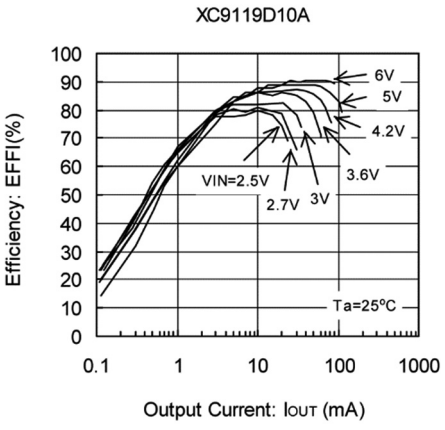
USP-6C
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9119D①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	10	FB voltage 1.0V (±2.0%)
③	Oscillation Frequency	A	1MHz
④⑤-⑥(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

XC9110/XC9111 Series

PFM Step-Up DC/DC Converter / Controller ICs 1 Cell 0.8V

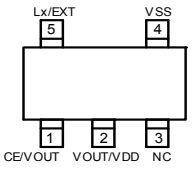
General Description

The XC9110/XC9111 series is a group of PFM controlled step-up DC/DC converter/controller ICs designed to generate low supply voltage by the combination of PFM control and CMOS structure. The series is ideal for applications where a longer battery life is needed such as in portable communication equipment. With a built-in 2.5ΩN-channel driver transistor, the XC9110C/E and XC9111C/E types provide a step-up operation by using only a coil, a capacitor, and a diode connected externally.
The XC9110/XC9111B, D and F versions can be used with an external transistor for applications requiring larger currents.
Output voltage is internally programmable in a range from 1.5V to 7.0V in increments of 0.1V (±2.5%).
Maximum oscillation frequency is set to 100kHz for XC9110/XC9111 series. (At light loads, it is set to 180kHz for the XC9111 series.) Options include products equipped with a CE pin (C and D versions) that allows the IC to be shut down thereby reducing quiescent current and with separated VDD/VOUT pins (E and F versions) to separate the power supply block and the output voltage detect block. With the XC9110 series, maximum duty cycle is set to 75% (VDD=3.3V) making it suitable for use with large current operations. The XC9111 series automatically switches duty ratio between 56% & 75% (VDD=3.3V) when it senses changes in load to drop output ripple voltage and can support both large and small currents. The external transistor types (B/D/F types) can be provided for applications, which require larger currents.

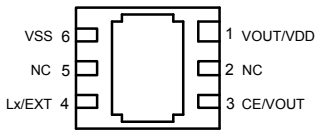
Features

Operating Voltage Range: Operating Hold Voltage 0.8V ~ 10.0V
Operating Voltage 0.9V ~ 10.0V
Output Voltage Range: 1.5V ~ 7.0V (0.1V increments)
Accuracy: ±2.5%
Max. Oscillation Frequency: 100kHz (±15%)
180kHz (for the XC9111 series, duty ratio:56% at light loads)
Built-in Switching N-ch Transistor:
Types A/C/E,
ON Resistance 2.5Ω(VDD=3.0V)
External Transistor Types: Types B/D/F
Lx Limit Voltage: Type E : More than VDD=2.0V
Types A/C : More than VOUT=2.0V
Low Quiescent Current: 20μA (when operating VOUT=3V)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-23, SOT-89
(for XC9111 series)
SOT-25, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

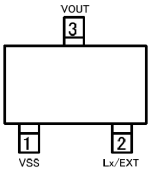
Pin Configuration



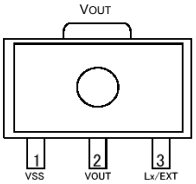
SOT-25
(TOP VIEW)



USP-6C
(BOTTOM VIEW)



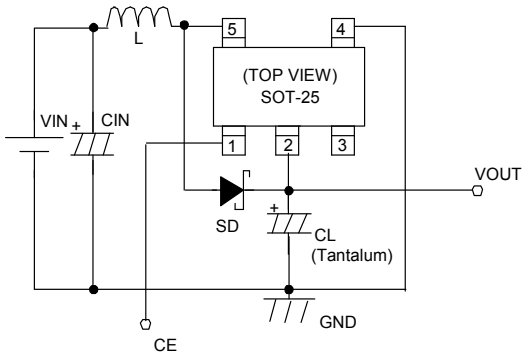
SOT-23 (TOP VIEW)



SOT-89 (TOP VIEW)

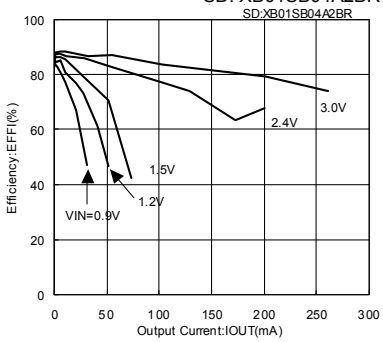
Typical Application Circuit

●Type C circuit



Typical Performance Characteristics

XC9111E331MR
L=100μH(CR54), CL47μF(Tantalum)
SD: XB01SB04A2BR



Ordering Information

XC9110①②③④⑤⑥−⑦: Fixed PFM control, 75% duty
XC9111①②③④⑤⑥−⑦: Fixed PFM control, 56% / 75% duty variable

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	CE Function	A	VDD / VOUT common type (for XC9111) Built-in Transistor
		B	VDD / VOUT common type (for XC9111) External Transistor
		C	CE pin Built-in Transistor
		D	CE pin External Transistor
		E	VDD / VOUT separated type Built-in Transistor
		F	VDD / VOUT separated type External Transistor
②③	Output Voltage	15 ~ 70	ex. 3.5V output →②= 3,③= 5
④	Max. Oscillation Frequency	1	100kHz
⑤⑥−⑦(*1)	Packages (Order Unit)	MR-G	①=A～B SOT-23 (3,000pcs/Reel) ①=C～F SOT-25 (3,000pcs/Reel)
		PR-G	①=A～B SOT-89 (1,000pcs/Reel)
		ER-G	①=C～F USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

*GreenOperation-compatible

XC9106/XC9107 Series

Variable Output Voltage Step-Up DC/DC Controllers IC

RoHS Compliant, Halogen Antimony FREE

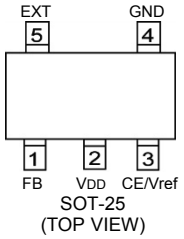
General Description

The XC9106/XC9107 series are step-up DC/DC controller ICs with an externally applied reference voltage (Vref).
Output voltage will be set with external resistors (RFB1 and 2) and Vref value. The series make it easy to control output voltage externally and are suited to software applications that need to vary voltage, such as LCD power supply for PDA.
Output will be stable no matter which load capacitors are used but if a low ESR capacitor is used, RSENSE of about 0.1Ω will be required and phase compensation will be achieved. This makes the use of ceramic capacitors much easier, and allows for lower output ripple and reduced PCB area requirements. Tantalum and electrolytic capacitors can also be used, in which case, RSENSE becomes unnecessary.
Oscillation frequencies of high clock, low ripple 300kHz and low quiescent current 100kHz are available.
The XC9107 series are PWM/PFM automatic switching controlled. Control switches from PWM to PFM during light loads with the XC9107 and the series is highly efficient from light loads to large output currents. By bringing the whole circuit down while the series is in the stand-by mode (CE/PWM pin : low), quiescent current can be reduced to less than 1.0μA.

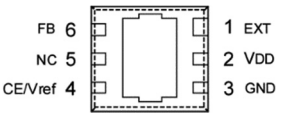
Features

Input Voltage Range: 0.9V ~ 10.0V
(Absolute Max. Rating: 12.0V)
Power Supply Voltage Range: 1.8V ~ 10.0V and more than Vref+0.7V
VREF Input Range: 0.8V ~ 2.5V (±2.0%)
Output Voltage: Vref x external split resistor ratio
Oscillation Frequency: 300kHz, 100kHz (±15%)
Output Current: More than 30mA
(VIN=3.3V, VOUT=20V)
Controls: PWM Control (XC9106)
PWM/PFM auto-switching Control (XC9107)
High Efficiency: 85% (TYP.)
Low Quiescent Current: 14μA (TYP.)
Stand-by Current: 1.0μA (MAX.)
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, USP-6B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

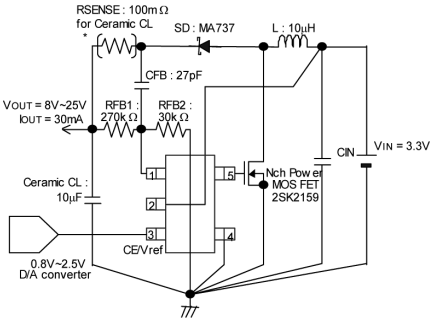


SOT-25
(TOP VIEW)

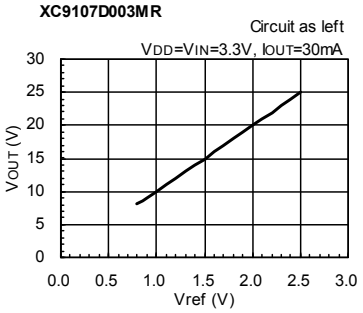


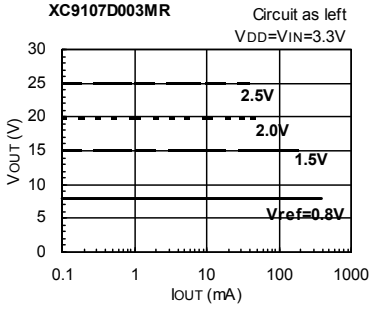
USP-6B
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics





Ordering Information

XC9106D①②③④⑤-⑥: PWM Fixed Control
XC9107D①②③④⑤-⑥: PWM / PFM Automatic Switching Control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Reference Voltage	00	Fixed voltage
③	Oscillation Frequency	3	300kHz
		1	100kHz
④⑤-⑥(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

XC9103/XC9104/XC9105 Series

Ceramic Cap. Compatible Step-Up DC/DC Controllers

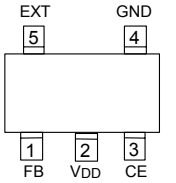
General Description

The XC9103/XC9104/XC9105 series are PWM, PWM/PFM auto switching /manual switching controlled multi-functional step-up DC/DC controllers.
Output will be stable no matter which load capacitors are used but should a low ESR capacitor be used, RSENSE of about 0.1Ω will be required and phase compensation will be achieved. This makes the use of ceramic capacitors much easier and allows for lower output ripple and reduced PCB area requirements. Tantalum and electrolytic capacitors can also be used, in which case, RSENSE becomes unnecessary.
With 0.9V of standard voltage supply internal, and using externally connected components, output voltage can be set up freely within a range of 1.5V to 30V. With 300kHz or 180kHz frequencies, the size of the external components can be reduced. Oscillation frequencies of 100kHz and 500kHz are also available as custom-designed products. The XC9103 offers PWM operation. The XC9104 offers PWM/PFM automatic switching operation. The PWM operation is shifted to the PFM operation automatically at light load so that it maintain high efficiency over a wide range of load currents. The XC9105 offers both PWM and PWM/PFM auto switching operations and it can be selected by external signal.
A current limiter circuit is built in to the IC (except with the 500kHz version) and monitors the ripple voltage on the FB pin. Operation is shut down when the ripple voltage is more than 250mV. The operations of the IC can be returned to normal with a toggle of the CE pin or by turning the power supply back on.

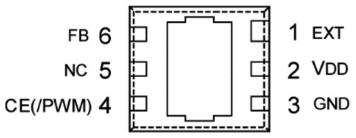
Features

Input Voltage Range: 0.8V ~ 10.0V
(Absolute Max. Rating: 12.0V)
Power Supply Voltage Range: 1.8V ~ 10.0V
FB Voltage: 0.9V (±2.0%)
Oscillation Frequency: 100, 180, 300, 500kHz (±15%)
180, 300kHz only for XC9103/04/05B type (with current limiter)
Output Current: more than 400mA (V_{IN}=1.8V, V_{OUT}=3.3V)
Controls: PWM controlled (XC9103)
PWM/PFM auto-switching Control (XC9104)
PWM/PFM manual-switching Control (XC9105)
High Efficiency: 85% (TYP.)
Low Quiescent Current: 16μA (TYP.)
Stand-by Current: 1.0μA (MAX.)
Current Limiter Function: Operates when ripple voltage =250mV (180kHz version)
Also available without current limiter (100kHz and 500kHz types are available only without current limiter)
Soft-start: 10ms
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, USP-6B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

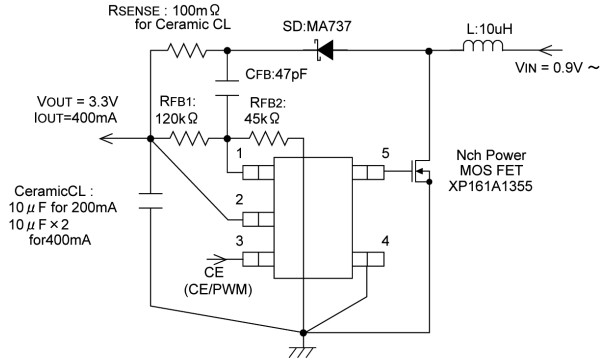


SOT-25
(TOP VIEW)



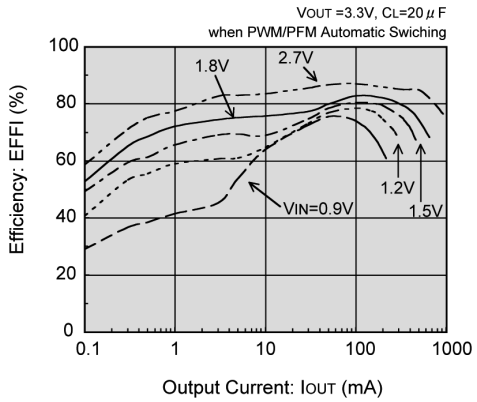
USP-6B
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XC9105D093MR



Ordering Information

XC9103①②③④⑤⑥-⑦: Fixed PWM control
XC9104①②③④⑤⑥-⑦: PWM / PFM automatic switching control
XC9105①②③④⑤⑥-⑦: PWM / PFM manual switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	B	With current limiter (180kHz, 300kHz only)
		D	Without current limiter
②③	Output Voltage	09	FB voltage 0.9V (±2.0%)
④	Oscillation Frequency	3	300kHz
		1	100kHz
		2	180kHz
		5	500kHz
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHs compliant.

*GreenOperation-compatible

XC9306 Series

Synchronous Buck-Boost DC/DC Converters

RoHS Halogen Antimony FREE

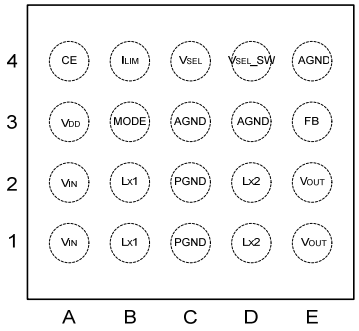
General Description

XC9306 series is a synchronous buck-boost DC/DC converter IC with buid-in FETs. The circuit topology switches over between buck and boost smoothly based on the relationship of the input voltage and the output voltage which is observed by the internal PWM controller. Due to the internal FETs, the number of external components is reduced. Also high oscillation frequency at 6MHz enables to use smaller external components such as a coil and capacitors. The input voltage range is 2.5V~5.5V and the output voltage is adjustable from 0.8V to 5.0V freely by using external resistors since the reference voltage circuit is embedded internally. The synchronous topology is adopted so the product has high efficiency feature. The control method is selectable either PWM mode (MODE pin: H) or PFM mode (MODE pin: L). Under the PFM mode, the efficiency at right load current will be improved. When “L” level is fed to CE pin, the product is in stand-by mode and the consumption current is going to be 2.0μA (MAX.) or less. Regarding other fanctions, the product has UVLO, Thermal shutdown protection, Soft-start function. The soft-start time is approx. 100μs and the output voltage can rise up quickly.

Features

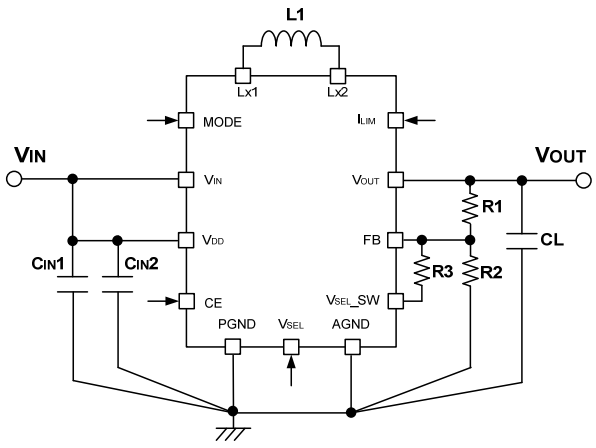
Input Voltage Range: 2.5V～5.5V
(Absolute Max. Rating: 7.0V)
Output Voltage Setting Range: 0.8V～5.0V (FB=0.5V)
Oscillation Frequency: 6MHz
Efficiency: 92% (V_{IN}=4.2V, V_{OUT}=3.3V/300mA)
Control Methods: PWM (Mode=High, I_{LIM}=Low)
Protection Circuit: Current limit, Thermal shutdown, UVLO
Functions: Soft-start, Power Save (Mode=Low),
Output Capacitor: Ceramic Capacitor Compatible
Coil Value: 0.5(0.47)μH
Package : WLP-20-01
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



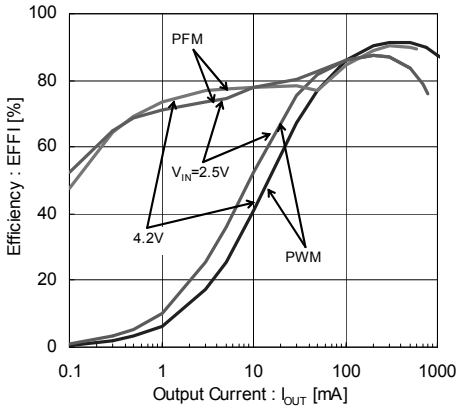
WLP-20-01
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

XC9306B05G0R Vout=3.3V



Ordering Information

XC9306B①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	05	Reference Voltage is fixed at 0.5V
③	Oscillation Frequency	G	6MHz
④⑤-⑥(*1)	Package (Order Unit)	0R-G	WLP-20-01 (6,000pcs/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9303 Series

High Efficiency, Synchronous Step-Up & Down DC/DC Controller ICs

General Description

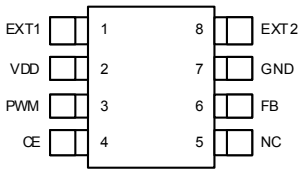
The XC9303 series is highly efficient, synchronous PWM, PWM/PFM switchable step-up / down DC/DC controller ICs. A versatile, large output current and high efficiency, step-up/down DC/DC controller can be realized using only basic external components - transistors, coil, diode, capacitors, and resistors for detecting voltages. High efficiency is obtained through the use of a synchronous rectification topology. The operation of the XC9303 series can be switched between PWM and PWM/PFM (automatic switching control) externally using the PWM pin. In PWM/PFM mode, the XC9303 automatically switches from PWM to PFM during light loads and high efficiencies can be achieved over a wide range of output loads conditions. Output noise can be easily reduced with PWM control since the frequency is fixed.

The XC9303 has a 0.9V (±2.0%) internal voltage supply and using externally connected components, output voltage can be set freely between 2.0V to 6.0V. With an internal 300kHz switching frequency smaller external components can be used. Soft-start time is internally set to 10ms and offers protection against in-rush currents when the power is switched on and prevents voltage overshoot.

Features

Input Voltage Range: 2.0V ~ 10.0V (Absolute Max. Rating: 12.0V)
Output Voltage Range: 2.0V ~ 6.0V Externally Set (V_{FB}=0.9V±2.0%)
Oscillation Frequency: 300kHz ±15%
Output Current: 800mA (V_{IN} = 4.2V, V_{OUT}=3.3V)
Low Quiescent Current: 55μA (TYP.)
Stand-by Current: 3.0μA (MAX.)
Soft-start: 10ms
Operating Ambient Temperature: -40°C ~ +85°C
Package: MSOP-8
Environmentally Friendly: EU RoHS Compliant, Pb Free

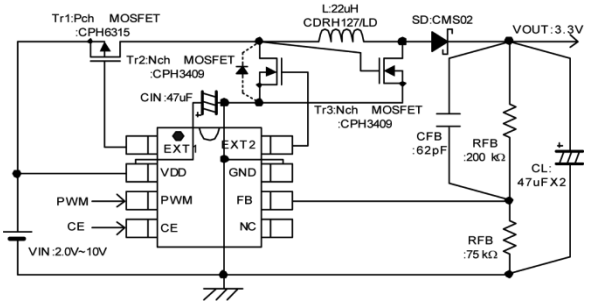
Pin Configuration



MSOP-8A
(TOP VIEW)

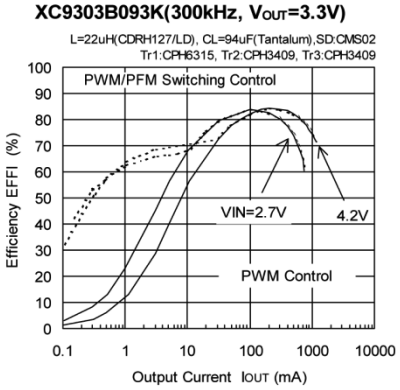
Typical Application Circuit

<XC9303B093K OUTPUT= 3.3V>



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9303①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	B	Standard type (10 pin)
②③	Output Voltage	09	FB voltage: 0.9V (±2.0%)
④	Oscillation Frequency	3	300kHz
⑤⑥-⑦(*1)	Package (Order Unit)	KR-G	MSOP-8A (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

*GreenOperation-compatible

XC9301/XC9302 Series

PWM, PWM/PFM Switching Step-Up & Down DC/DC Converters

General Description

The XC9301/XC9302 series are step-up/down DC/DC converter controller ICs with fast, low ON resistance drivers built-in. A versatile, large output current, step-up/down DC/DC converter can be realized using only 4 basic external components - transistors, coils, diodes and capacitors.

Output voltage is selectable in 0.1V steps within a 2.4V ~ 6.0V (± 2.5%) range and switching frequency is set at 180kHz or 300kHz.

The XC9302 series switches from PWM to PFM control during light loads and the series offers high efficiencies from light loads through to large output currents.

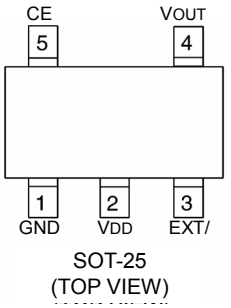
Soft-start time is internally set to 10 ms which offers protection against rush currents when the power is switched on and also against voltage overshoot.

During shutdown (CE pin = L), consumption current can be reduced to as little as 0.5μA or less.

Features

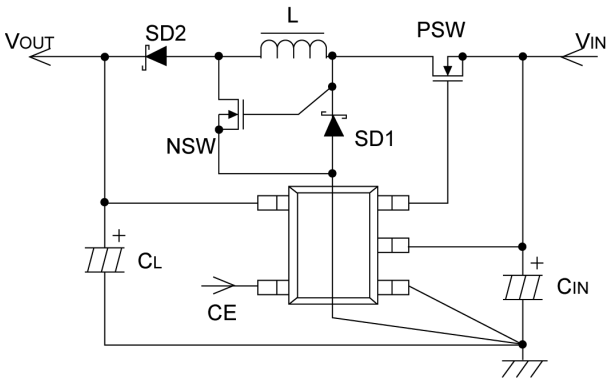
Input Voltage Range: 2.0V ~ 10.0V
(Absolute Max. Rating: 12.0V)
Output Voltage Range: 2.4V ~ 6.0V (0.1V increments)
Accuracy: ± 2.5%
Oscillation Frequency: 180KHz, 300kHz (± 15%)
Output Current: more than 250mA (V_{IN}=2.4V, V_{OUT}=3.3V)
Low Quiescent Current: 15μA (TYP.)
Efficiency: 81% (TYP.) @ V_{OUT}=5.0V
78% (TYP.) @ V_{OUT}=3.3V
Stand-by Current: 0.5μA (MAX.)
Operating Temperature Range: -40°C ~ +85°C
Package: SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

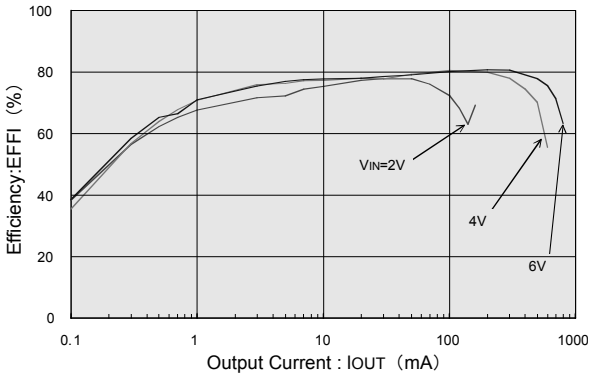


SOT-25
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9301①②③④⑤⑥-⑦: PWM Control

XC9302①②③④⑤⑥-⑦: PWM / PFM switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Standard	A	Fixed
②③	Output Voltage	20~60	e.g. V_{OUT}=3.0V→②=3, ③=0, V_{OUT}=5.3V→②=5, ③=3
④	Oscillation Frequency	2	180kHz
		3	300kHz
⑤⑥-⑦ (*1)	Package (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9801/XC9802 Series

Step-Up Charge Pump

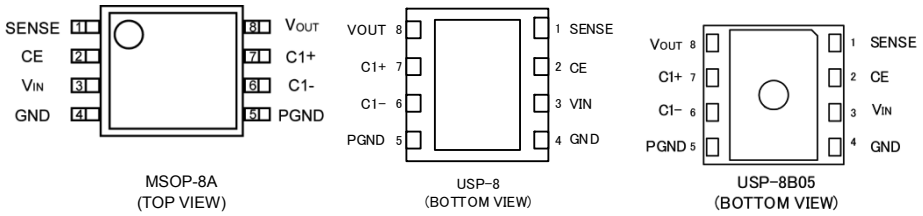
General Description

The XC9801/XC9802 series are fixed regulated voltage step-up charge pump ICs which provide stable, highly efficient, positive voltages with the only external components required being 2 capacitors.
Since regulating is done via the control of the charge pump's gate voltage waveform, ripple is minimal. Output voltage is selectable in 100mV steps within a 2.5V ~ 6.0V range.
Control of XC9802 switches to PFM (pulse skip) during light loads without affecting output impedance or ripple so that the IC is protected against drops in efficiency. Connecting the SENSE pin to the GND pin allows the IC to be used as a voltage doubler.
As well as the ultra small MSOP-8A, USP-8 and USP-8B05 packages, the small consumption current and high efficiencies of the series make the XC9801 suitable for use with all types of battery operated applications.

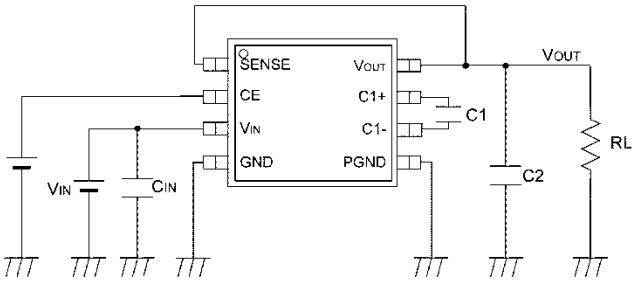
Features

Input Voltage Range: 1.8V ~ 5.5V
(Absolute Max. Rating: 6.0V)
Output Voltage Range: 2.5V ~ 6.0V
Small Input Current: 80μA (no load : XC9802)
Output Current: 80mA (3.6V → 5V step-up)
Low Quiescent Current: 3mA (TYP.)
Oscillation Frequency: 300kHz
Stand-By Current (CE 'L'): 2.0μA (TYP.)
Can be used as a Step-Up Doubler (sense = 0V)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: MSOP-8A
USP-8
USP-8B05
Environmentally Friendly: EU RoHS Compliant, Pb Free

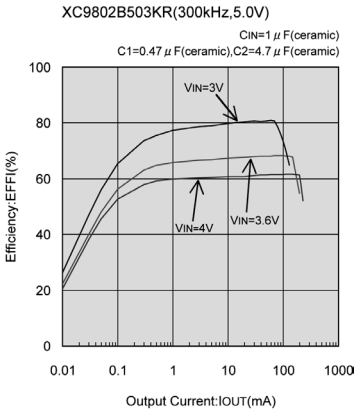
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC9801①②③④⑤⑥-⑦: Without Pulse Skip
XC9802①②③④⑤⑥-⑦: With Pulse Skip

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	True Logic Level at CE Pin	B	Positive
②③	Output Voltage	50	Standard Voltage VOUT=5.0V→②=5, ③=0
		25 ~ 60	Semi-custom Voltage e.g. VOUT=2.5V→②=2, ③=5
④	Oscillation Frequency	3	300kHz
⑤⑥-⑦(*1)	Packages (Order Unit)	KR-G	MSOP-8A (1,000pcs/Reel)
		DR-G	USP-8 (3,000pcs/Reel)
		ER-G	USP-8B05 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6351A Series

Inverter Charge Pump

RoHS Compliant, Halogen Antimony FREE

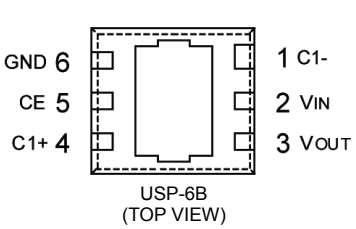
General Description

The XC6351A series are charge pump voltage inverter ICs that have 4 MOSFETs built in. Since highly efficient negative voltages can be generated with only 2 external capacitors connected, GaAs bias power supplies & OpAmp's negative power supplies etc., can be easily accommodated on a standard PCB.
A mini-molded, 6 pin, SOT-26 package, USP-6B Package provides for space saving and makes high density mounting possible.
Low power consumption and high efficiency make this series perfect for use with battery operated applications.
Since the IC's operations stop when output is shutdown via the CE (chip enable) function, total power consumption reduction is possible in applications which use this IC.

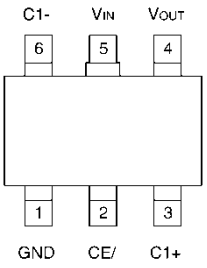
Features

Operating Voltage Range: 1.2V ~ 5.0V
(Absolute Max. Rating: 6.0V)
Oscillator Frequency: 120kHz
35kHz (custom)
Low Quiescent Current : 310μA (TYP.)
100μA (35kHz(TYP.))
High Efficiency: 90% (TYP.) (RL = 2kΩ)
Stand-by Current: 2.0μA (MAX.)
Operating Ambient Temperature: -30°C ~ +80°C
Packages: SOT-26
USP-6B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

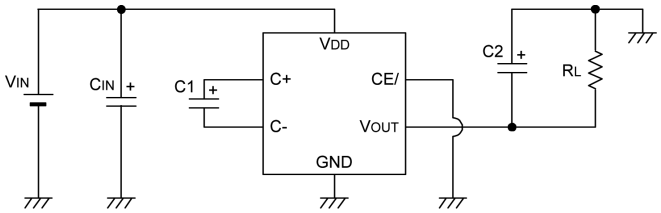


USP-6B
(TOP VIEW)

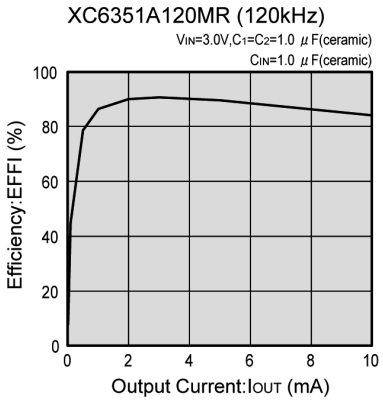


SOT-26
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6351A①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②③	Oscillation Frequency	120	120kHz
		035	35kHz (custom)
④⑤-⑥(*1)	Packages (Order Unit)	MR-G	SOT-26 (3,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9133 Series

Step-Up DC/DC Converter-LED Backlight Driver

General Description

The XC9133 series is a fixed frequency, constant current step-up DC/DC converter which is optimized for LED backlight applications in mobile phones, PDAs and digital cameras. Output voltage of up to 17.5V is possible so that four white LEDs can be driven in series. Since the LED current is set by only one external resistor, all white LEDs placed in series can be turned on at the same time. The new DC/DC Converter is also able to drive a network of two parallel banks of three LEDs.

LED dimming is controlled by adjusting the duty cycle of a PWM signal (10kHz Max.) applied to the CE pin.

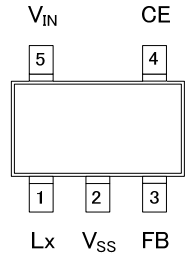
Efficiency is high with a 0.2V low feedback reference voltage ensuring the RLED losses are minimal. In addition, an internal MOSFET with a low RDSON of 2.4Ω is used. A low profile and small board area solution can be achieved using a chip inductor and a small ceramic output capacitor C_L=0.22μF as a result of the high 1MHz switching frequency.

If white LEDs are opened or damaged, the detector built in the Lx pin causes the IC to stop oscillating, preventing excessive increase of the output voltage.

Features

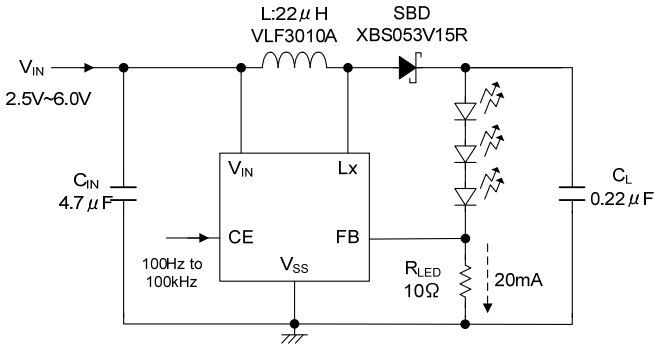
Input Voltage Range: 2.5V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Output Voltage Range: Up to 17.5V externally set-up
Reference voltage 0.2V ±5.0%
Output Current: 30mA (3 white LEDs, V_{IN}=3.6V)
Oscillation Frequency: 1.0MHz (±20%)
ON Resistance: 2.4Ω
High Efficiency: 85%
3 white LEDs in series
V_{IN}=3.6V, I_{LED}=20mA
Control: PWM control
Stand-by Current: I_{STB}=1.0μA (MAX.)
Output Capacitor: 0.22μF, ceramic
Lx Limit Current: 360mA (TYP.)
Lx Overvoltage Limit: 19V (TYP.)
Operating Ambient Temperature: -40°C ~ +85°C
Package: SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



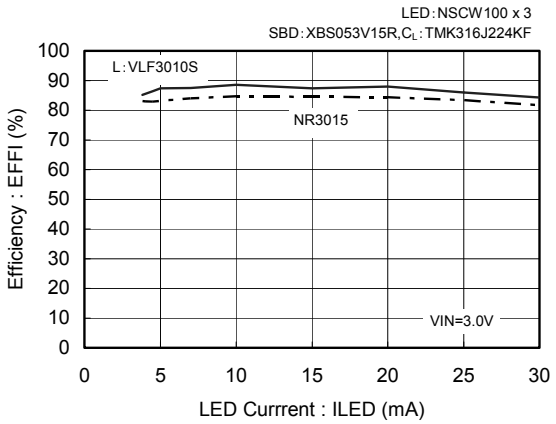
SOT-25 (TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

●XC9133B02A Series



Ordering Information

XC9133①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Lx Overvoltage Limit	B	19V (TYP.)
②③	FB Voltage	02	0.2V (±5.0%)
④	Oscillation Frequency	A	1MHz
⑤⑥-⑦(*1)	Package (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9401 Series

Off-line Controllers for LED Lighting

RoHS
Halogen Antimony FREE

General Description

The XC9401 series are off-line controller ICs for LED lighting. Through optimization of the external components, these ICs can be made to operate in a range from 85VAC to 270VAC, as well as by DC input, and a diversity of specifications can be achieved by selecting components appropriate for the circuit configuration. Fixed off-time control is used for the basic control method, and by detecting the current that flows to the external power MOSFET, the current that flows to the LED is monitored to provide a stable power supply for LED lighting. Two product series differing by function type are available.

The circuit configuration of type A is designed for the power factor, achieving a high power factor by synchronizing the LED current to the input current (sine wave).

Type C hold the peak current due to switching that flows to the external power MOSFET constant, enabling the LED current to be kept constant.

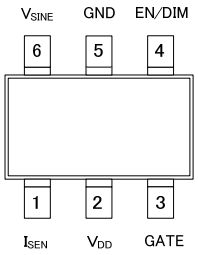
With the type C, dimming is possible by inputting a PWM signal into the EN/DIM pin to set the LED current within a range of 1% to 100%.

Features

Operating Voltage: 85VAC ~ 270VAC, Supports DC input
Fixed Off-time: 6.0μs (TYP.)
ISEN Voltage Accuracy: ±2.5% (Type C)
Protection Circuits: Thermal Shutdown 150 °C (TYP.)
V_{DD} Over voltage protection, V_{DD}=18V (TYP.)
UVLO, V_{DD}=6.5V (TYP.)
Over current protection V_{ISEN} = 0.7V(TYP.)
Dimming: PWM Dimming (1% ~ 100%)
Packages: SOT-26 (Type A)
SOT-25 (Type C)
Operating Ambient Temperature: -40°C ~ +85°C
Environmentally Friendly: EU RoHS Compliant, Pb Free

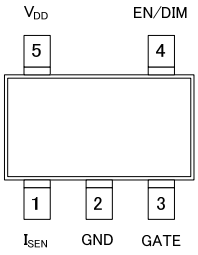
Pin Configuration

Type A



SOT-26
(TOP VIEW)

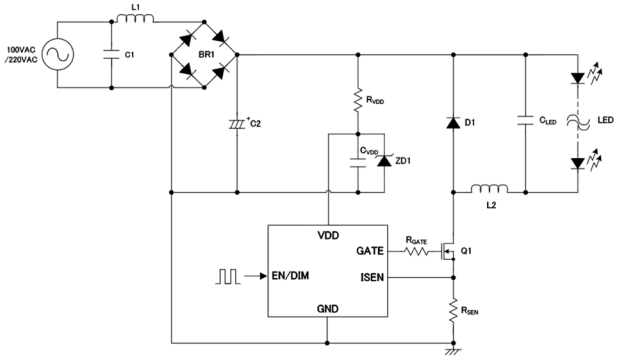
Type C



SOT-25
(TOP VIEW)

Typical Application Circuits

XC9401 Type C



Ordering Information

XC9401①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	PFC Function Built-in (V_{SINE} voltage external input)
		C	LED constant current circuit
②	OFF Time	6	OFF Time is fixed in 6μs
③④	Accuracy	05	Type A: I_{SEN} Voltage, Accuracy is ±5.0%
		0C	Type C: I_{SEN} Voltage, Accuracy is ±2.5%
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-26 (3,000pcs/Reel) (Type A and B Only)
		SR-G	SOT-25 (3,000pcs/Reel) (Type C Only)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9519 Series

Dual Output Step-Up/Inverting DC/DC Converter

RoHS Halogen Antimony FREE

General Description

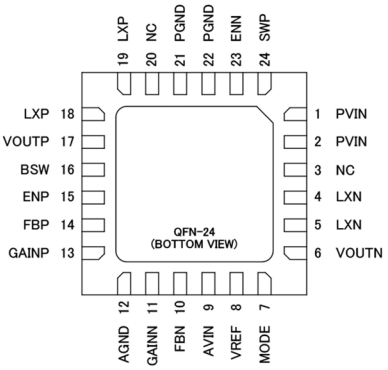
The XC9519 series is a 2 channel (step-up and inverting) DC/DC converter IC. One DC/DC converter is a step-up DC/DC and the other is an inverting DC/DC converter. The step-up converter compares a built-in reference voltage 1.0V to the FBP voltage (±1.5%) and a positive output voltage can be set freely with the external components up to 18V. The inverting DC/DC converter compares a difference between a reference voltage and the FBN voltage (±1.5%) to the GND, then a negative output voltage can be set until -15V with the external components.
With a 1.2MHz frequency, the size of the external components can be reduced. As for operation mode, the device can be selected to use PWM control or automatic PWM/PFM switching control by the MODE pin. In the automatic PWM/PFM switching control mode, control switches from PWM to PFM during light loads. The series is highly efficient from light loads through to large output currents. In the PWM control mode, noise is easily reduced since the frequency is fixed. The control mode can be selected for each application. The soft start and current control functions are internally optimized. During stand-by, all circuits in the IC are shutdown to reduce current consumption to as low as 1.0μA or less. The device includes a gate control pin for the P-channel MOSFET which is used for a load disconnection at the stand-by mode. The GAINP and GAINN pins are used for loop compensation in order to optimize load transient response. With the built-in UVLO (Under Voltage Lock Out) function, the internal driver transistor is forced OFF when input voltage becomes 2.2V or lower.

Features

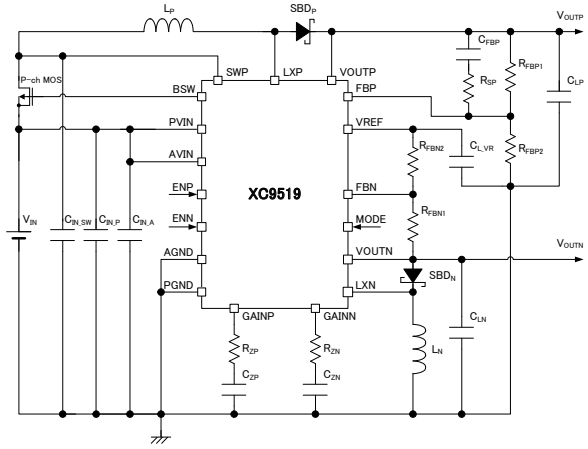
Input Voltage: 2.7V ~ 5.5V
(Absolute Max. Rating: 6.0V)
Output Current: 500mA @V_{IN}=3.7V, V_{OUTP}=5.0V, V_{OUTN}=-5.0V
Positive Output Voltage: 4.0V(*1) ~ 18.0V (±1.5% @25°C)
Negative Output Voltage: -15.0V(*2) ~ -4.0V (±1.5% @25°C)
Oscillation Frequency: 1.2MHz
Soft-Start Circuit Built-In: Step-Up DC/DC converter 2.5ms (TYP.)
Inverting DC/DC converter 2.2ms (TYP.)
Protection Circuits: Over Current Limit (Integral Latching)
Short Protection Latching
UVLO
Thermal Shutdown
Over Voltage Protection
Functions: Control Pin
Load Disconnect Pin
Phase Compensation Pin
Ceramic Capacitor Compatible
Operating Ambient Temperature: -40 ~ +85°C
Package: QFN-24
Environmentally Friendly: EU RoHS Compliant, Pb Free

(*1) $V_{OUTPSET} \geqq V_{IN}+0.2V$ ($V_{OUTPSET}$: Positive output voltage range)
(*2) $V_{IN} - V_{OUTNSET} + V_{FN} \leqq 21.0V$
(V_{FN} : Forward voltage of SBD_N, $V_{OUTNSET}$: Negative output voltage range)

Pin Configuration

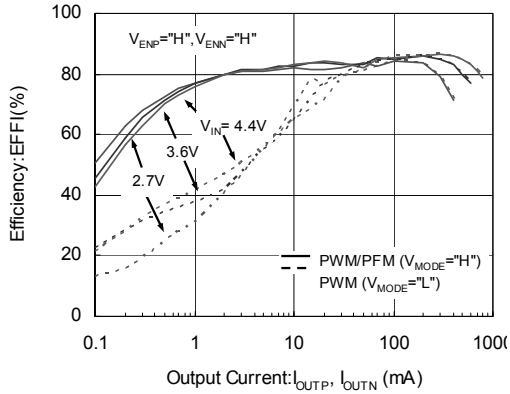


Typical Application Circuit



Typical Performance Characteristics

V_{OUTP}=5.0V, V_{OUTN}=-5.0V, $I_{OUTP}=I_{OUTN}$
C_{LP}, C_{LN}=4×4.7μF, L_P, L_N=3.3μH (VLF5014S-3R3M2R0), SBD_P, SBD_N: CMS03
P-ch MOS: EMH1303, R_{ZP}=7.5kΩ, C_{ZP}=4.7nF, R_{ZN}=130kΩ, C_{ZN}=0.47nF



Ordering Information

XC9519①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	UVLO Detect Voltage	A	UVLO Detect Voltage 2.2 V UVLO Hysteresis width 0.2 V
②③	Oscillation Frequency	12	1.2 MHz
④	Max. Current Limit	A	2.0A
⑤⑥-⑦(*1)	Package (Order Unit)	ZR-G	QFN-24 (1,000pcs/Reel)(*2)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) The XC9519 reels are shipped in a moisture-proof packing.

*GreenOperation-compatible

XC9516 Series

Triple Output Power Supply for TFT-LCD

RoHS Compliant, Halogen Antimony FREE

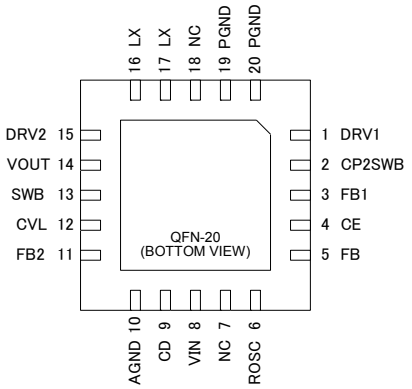
General Description

The XC9516 series can offer three different power supplies to TFT-LCD panels. These power supplies consist of a step-up DC/DC converter for a source driver, positive and negative charge pumps for a gate driver.
This IC has power-on sequences to keep inrush current as small when output voltage rises. The step-up DC/DC output can be used as power-on sequences with adding a P-channel FET as external component. Also, the FET can shut down a path to the power input line when CE pin is low.

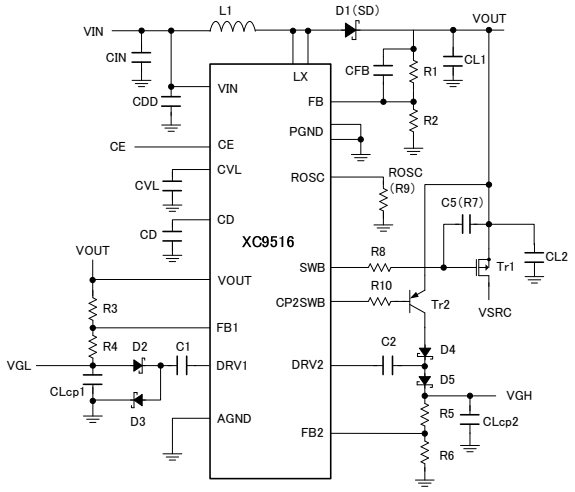
Features

Input Voltage Range:	2.5V ~ 5.5V (Absolute Max. Rating: 6.0V)
Max. Output Voltage Range:	19V (Step-up DC/DC)
Output Voltage Accuracy:	±1.5%
Output Current:	500mA (V_{IN}=5.0V, V_{OUT}=9.0V)
Oscillation Frequency:	300kHz ~ 1.2MHz (Adjustable)
External MOSFET Gate Signal Output:	N-Ch Open Drain
Switch Over-Current Protection:	1.3A
Soft-Start Time:	Internally fixed
Protection:	Over Voltage Protection (Step-up DC/DC 21V) Short Circuit Protection (Step-up DC/DC) Short Circuit Protection (Positive and Negative Charge Pump)
Thermal Shutdown:	150°C
UVLO:	1.87V
Operating Ambient Temperature:	-40°C ~ +85°C
Package:	QFN-20
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



Typical Application Circuit

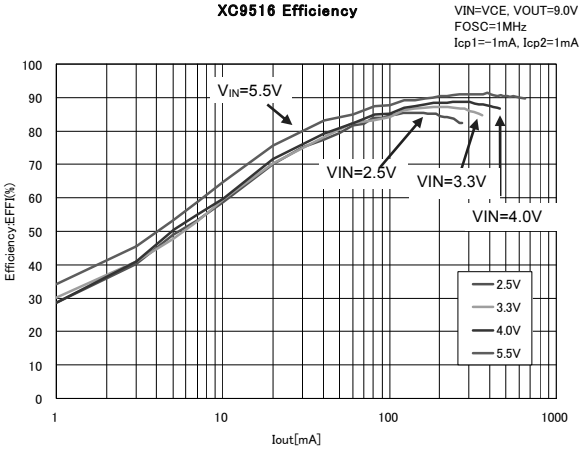


e.g) Components List

V_{OUT} = 9.2V, VGL = -5.3V, VGH= 12V	R1 = 820 kΩ
CIN = 4.7 μF	R2 = 100 kΩ
CL1,CL2 =4.7 μF	R3 = 390 kΩ
C1, C2 = 0.01 μF	R4 = 300 kΩ
CVL,CD = 0.1 μF	R5 = 820 kΩ
CDD = 1 μF	R6 = 75 kΩ
CLcp1,CLcp2 = 1 μF	R8 = 300 kΩ
CFB = 22pF	ROSC（R9） = 130 kΩ
C5 = 0.01 μF	R10 = 51 kΩ

Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9516①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTON
①	UVLO Detect Voltage	A	Detect Voltage: 1.87V, Hysteresis Width 0.44V
②③	Over Voltage Limit	21	Over Voltage Detect Voltage: 21V
④	Over Current Limit	A	Over Current Detect Voltage: 1.3A
⑤⑥-⑦(*1)	Package (Order unit)	ZR-G	QFN-20 (1,000pcs/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9505 Series 2 Channel Output Step-Down / Inverting DC/DC Controller IC

General Description

XC9505 series are PWM controled, PWM/PFM automatic switching, 2 channel (step-down and inverting) DC/DC controller ICs. With 0.9V of standard voltage supply internal, and using externally connected components, the output 1 voltage (step-down DC/DC controller) can be set freely within a range of 0.9V to 6.0V. Since the output 2 (inverting DC/DC controller) has a built-in 0.9V reference voltage (±2.0%), negative voltage can be set with the external components.

With a 180kHz frequency, the size of the external components can be reduced. Switching frequencies of 300kHz and 500kHz frequency are also available as custom designed products.

The control of the XC9505 series can be switched between PWM control and PWM/PFM automatic switching control using external signals. Control switches from PWM to PFM during light loads when automatic switching is selected and the series is highly efficient from light loads through to large output currents. Noise is easily reduced with PWM control since the frequency is fixed.

The series gives freedom of control selection so that control suited to the application can be selected. Soft-start time is internally set to 10ms (output1) which offers protection against rush currents and voltage overshoot when the power is switched on.

Features

2 ch. DC/DC Controller

Output 1: Step-Down DC/DC Controller

Output Voltage Range : 0.9V ~ 6.0V
Externally Set (V_{FB}=0.9V±2.0%)
Output Current : ≧1000mA (V_{IN}=5.0V, V_{OUT}=3.3V)
Soft-Start Internally Set-Up

Output 2: Inverting DC/DC Controller

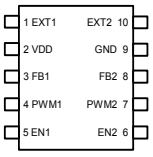
Output Voltage Range : -30.0V ~ 0.0V
Externally Set (V_{FB}=0.9V±2.0%)
Output Current : ≧- 100mA (V_{IN}=5.0V, V_{OUT}= - 3.3V)

Common

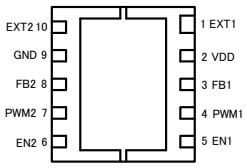
Operating Voltage Range: 2.0V ~ 10.0V
(Absolute Max. Rating: 12.0V)
Oscillation Frequency : 180kHz, 300kHz, 500kHz
Low Quiescent Current: 50μA (TYP.)
Stand-by Current : 3.0μA (MAX.)

Operating Ambient Temperature: -40°C ~ +85°C
Packages : MSOP-10, USP-10
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



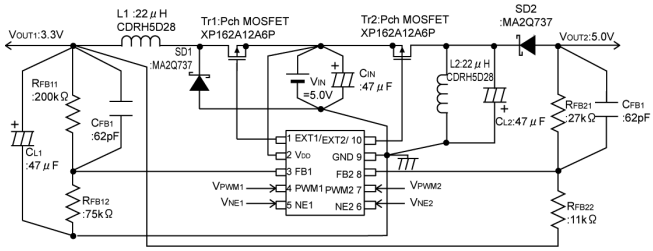
MSOP-10
(TOP VIEW)



USP-10
(BOTTOM VIEW)

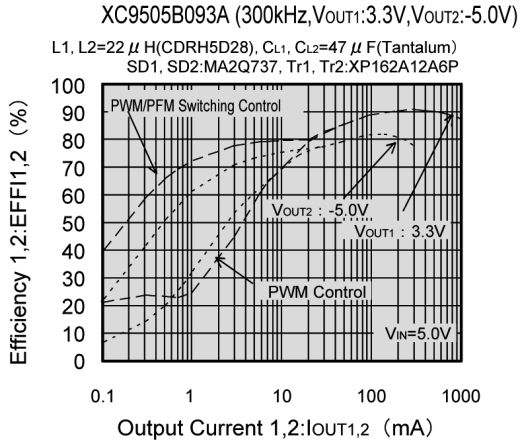
Typical Application Circuit

<XC9505B092A Input: 2 cell, V_{OUT}: 3.3V, V_{OUT}: - 5.0V



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9505①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	B	Standard type (10 pin)
②③	Output Voltage	09	FB voltage 0.9V (±2.0%)
④	Oscillation Frequency	2	180kHz
		3	300kHz (custom)
		5	500kHz (custom)
⑤⑥-⑦(*1)	Packages (Order Unit)	AR-G	MSOP-10 (1,000pcs/Reel)
		DR-G	USP-10 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

*GreenOperation-compatible

XC9504 Series 2 Channel Output Step-Up / Inverting DC/DC Controller IC

RoHS Compliant, Halogen Antimony FREE

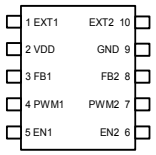
General Description

The XC9504 series are PWM control, PWM/PFM switching, 2 channel (step-up and inverting) DC/DC controller ICs.
With 0.9V of standard voltage supply internal, and using externally connected components, the output 1 voltage (step-up DC/DC controller) can be set freely within a range of 1.5V ~ 30V. Since output 2 (inverting DC/DC controller) has a built-in 0.9V reference voltage (±2.0%), a negative voltage can be set with the external components.
With a 180kHz frequency, the size of the external components can be reduced. Switching frequencies of 300kHz are also available as custom-designed products.
The control of the XC9504 series can be switched between PWM control and PWM/PFM automatic switching control using external signals. Control switches from PWM to PFM during light loads when automatic switching is selected and the series is highly efficient from light loads through to large output currents. Noise is easily reduced with PWM control since the frequency is fixed.
The series gives freedom of control selection so that control suited to the application can be selected.
Soft-start time is internally set to 10ms (output 1) which offers protection against rush currents and voltage overshoot when the power is switched on .

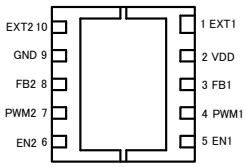
Features

2ch. DC/DC Controller
Output 1: Step-Up DC/DC Controller
Output Voltage Range : 1.5V ~ 30.0V
Externally Set (V_{FB}=0.9V±2.0%)
Output Current : ≧20mA (V_{IN}=3.3V,V_{OUT}=15V)
Soft-Start Internally Set-Up
Output 2: Inverting DC/DC Controller
Output Voltage Range : -30.0V ~ 0.0V
Externally Set (V_{FB}=0.9V±2.0%)
Output Current : ≧-20mA (V_{IN}=3.3V,V_{OUT}=-7.0V)
Common
Supply Voltage Range : 2.0V ~ 10.0V
(Absolute Max. Rating: 12.0V)
Low Quiescent Current: 60μA (TYP.)
Stand-by Current : 3.0μF(MAX.)
Oscillation Frequency : 180kHz, 300kHz, 500kHz
Operating Ambient Temperature: -40°C ~ +85°C
Packages : MSOP-10, USP-10
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



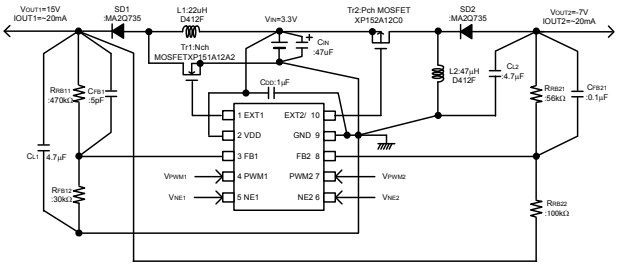
MSOP-10
(TOP VIEW)



USP-10
(BOTTOM VIEW)

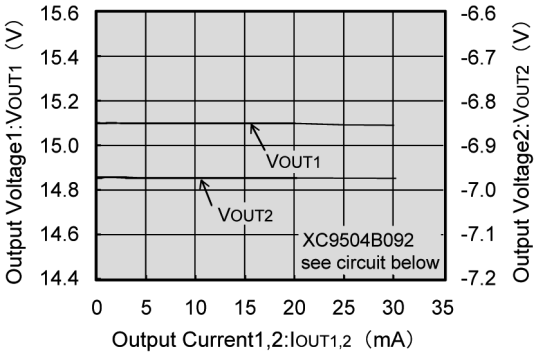
Typical Application Circuit

＜XC9504B092A Input: 3.3V, Output ①: 15V, Output ②: -7V＞



Typical Performance Characteristics

XC9504B092A
(180kHz, Output1=15V, output2=-7V)
L1=22μH (CR54), CL1=4.7μH (ceramic), SD1:MA2Q737, Tr1:XP151A12A2M
L2=47μH (CR54), CL2=4.7μH (ceramic), SD2:MA2Q737, Tr2:XP152A12C0M



Ordering Information

XC9504①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	B	Standard type (10 pin)
②③	Output Voltage	09	FB voltage 0.9V (±2.0%)
④	Oscillation Frequency	2	180kHz
		3	300kHz (custom)
		5	500kHz (custom)
⑤⑥-⑦(*1)	Packages (Order Unit)	AR-G	MSOP-10 (1,000pcs/Reel)
		DR-G	USP-10 (3,00pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC9502 Series

2 Channel Output Step-Up / Down DC/DC Controller IC

RoHS Compliant, Halogen Antimony FREE

General Description

The XC9502 series are PWM controlled, PWM/PFM automatic switching controlled, multi-functional, 2 channel step-up and down DC/DC controller ICs. With 0.9V of standard voltage supply internal, and using externally connected components, the output 1 voltage (step-up DC/DC controller) can be set freely within a range of 1.5V to 30V. Since the output 2 (step-down DC/DC controller) has a built-in 0.9V reference voltage (±2.0%), 0.9V to 6.0V can be set using external components.

With a 180kHz frequency, the size of the external components can be reduced. Switching frequencies of 300kHz & 500kHz are also available as custom-designed products.

The control of the XC9502 series can be switched between PWM control and PWM/PFM automatic switching control using external signals. Control switches from PWM to PFM during light loads when automatic switching is selected and the series is highly efficient from light loads through to large output currents.

Noise is easily reduced with PWM control since the frequency is fixed. The series gives freedom of control selection so that control suited to the application can be selected. Soft-start time is internally set to 10ms (Output 1) and offers protection against in-rush currents when the power is switched. This also prevents voltage overshoot.

Features

2ch DC/DC Controller

<Output 1: Step-Up DC/DC Controller>

Output Voltage Range: 1.5V ~ 30.0V
Externally Set (V_{FB}=0.9V±2.0%)

Output Current: ≦300mA (V_{IN}=1.8V,V_{OUT}=3.3V)

<Output 2: Step-Down DC/DC Controller>

Output Voltage Range: 0.9V ~ 6.0V
Externally Set (V_{FB}=0.9V±2.0%)

Output Current : ≦1000mA (V_{IN}=3.3V, V_{OUT}=1.8V)

<Common>

Supply Voltage Range: 2.0V ~ 10.0V
(Absolute Max. Rating: 12.0V)

Oscillation Frequency: 180kHz (±15%)
* 300kHz, 500kHz custom

Low Quiescent Current: 50μA (TYP.)

Stand-by Current: 3.0μA (MAX.)

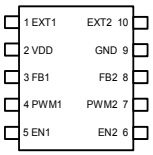
Soft-Start: 10ms

Operating Ambient Temperature: -40°C ~ +85°C

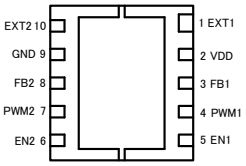
Packages: MSOP-10, USP-10

Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



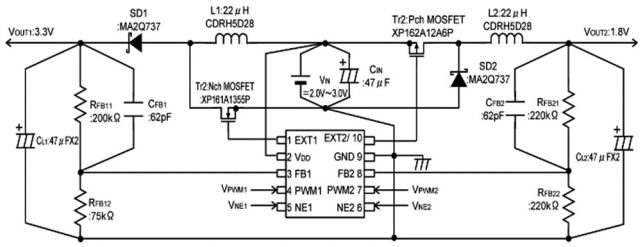
MSOP-10
(TOP VIEW)



USP-10
(BOTTOM VIEW)

Typical Application Circuit

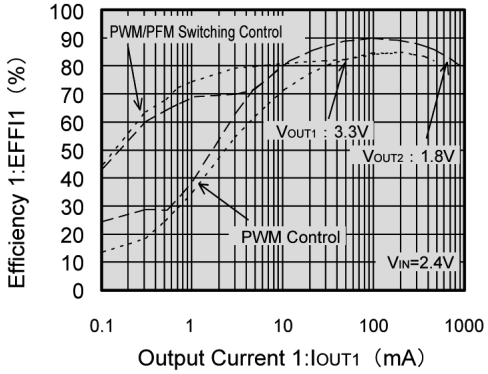
<XC9502B092A Input : 2 cell, VOUT①: 3.3V, VOUT②: 1.8V >



Typical Performance Characteristics

XC9502B093A
(300kHz,VOUT1:3.3V,VOUT2:1.8V)

L1=15μH, L2=22μH(CDRH5D28), C_{L1}, C_{L2}=47μF(Tantalum)
SD1, SD2:MA2Q737, Tr1:XP161A1355P, Tr2:XP162A12A6P



Ordering Information

XC9502①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	B	Standard type (10 pin)
②③	Output Voltage	09	FB voltage: 0.9V (±2.0%)
④	Oscillation Frequency	2	180kHz
		3	300kHz (custom)
		5	500kHz (custom)
⑤⑥-⑦(*1)	Packages (Order Unit)	AR-G	MSOP-10 (1,000pcs/Reel)
		DR-G	USP-10 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

*GreenOperation-compatible

XC9501 Series

2 Channel Output Step-Up DC/DC Controller IC

RoHS Compliant, Halogen Antimony FREE

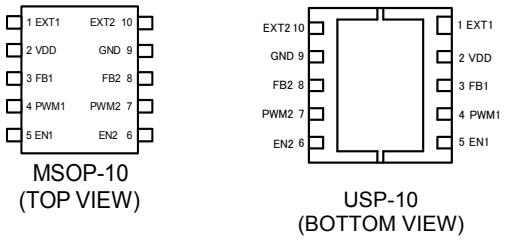
General Description

The XC9501 series are PWM controlled, PWM/PFM automatic switching controlled, multi-functional, dual step-up DC/DC converter controller ICs.
With 0.9V (±2.0%) of standard voltage supply internal, and using externally connected components, output voltage can be set freely on both DC/DC controllers between 1.5V to 30.0V.
With a 180kHz frequency, the size of the external components can be reduced. 100kHz, 300kHz and 500kHz switching frequencies are also available as custom-designed products.
The control of the XC9501 series can be switched between PWM control and PWM/PFM automatic switching control using external signals. Control switches from PWM to PFM during light loads when automatic switching is selected and the series is highly efficient from light loads to large output currents. Noise is easily reduced with PWM control since the switching frequency is fixed.
The XC9501 series provides the option of being able to select the control suited to the application.
Soft-start time is internally set to 10ms which offers protection against rush currents when the power is switched on and also against voltage overshoot.

Features

Input Voltage Range: 0.9V ~ 10.0V
(Absolute Max. Rating: 12.0V)
Power Supply Voltage Range: 2.0V ~ 10.0V
Output Voltage Range: 1.5V ~ 30.0V
Switching Frequency: 100kHz, 180kHz, 300kHz, 500kHz
Output Current: 200mA (V_{IN}=1.8V, V_{OUT}=3.3V)
Low Quiescent Current: 50 μA (TYP.)
Stand-by Current: 3.0 μA (MAX.)
Soft-start: 20ms (MAX.)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: MSOP-10
USP-10
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

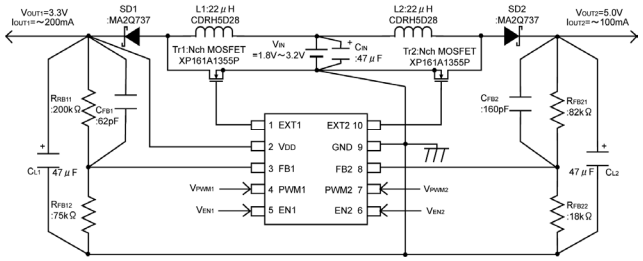


MSOP-10
(TOP VIEW)

USP-10
(BOTTOM VIEW)

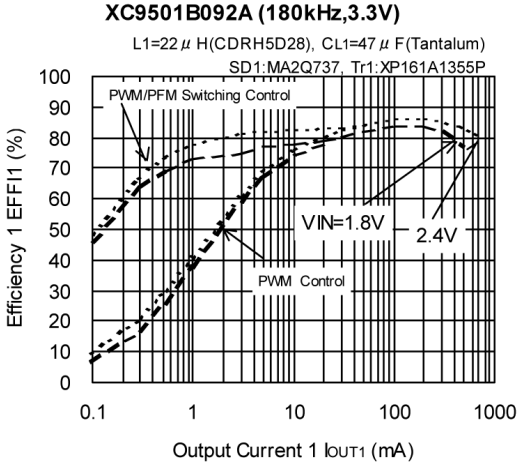
Typical Application Circuit

<XC9501B092A Input: 2 cells, Output ①: 3.3V, Output ②: 5.0V>



Typical Performance Characteristics

●Efficiency vs. Output Current



Ordering Information

XC9501①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of DC/DC Controller	B	Standard (10 pin)
②③	Output Voltage	09	FB voltage: 0.9V (±2.0%)
④	Oscillation Frequency	1	100kHz (custom)
		2	180kHz
		3	300kHz (custom)
		5	500kHz (custom)
⑤⑥-⑦(*1)	Packages (Order Unit)	AR-G	MSOP-10 (1,000pcs/Reel)
		DR-G	USP-10 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6136 Series

Ultra Low Power (88nA) Voltage Detector

RoHS Halogen Antimony FREE

Preliminary

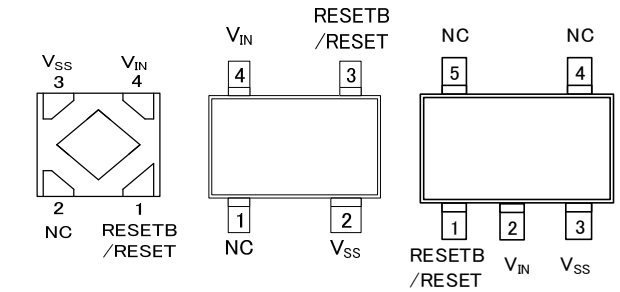
General Description

The XC6136 series is ultra-low power voltage detector with high accuracy detection, manufactured using CMOS process and laser trimming technologies.
The device is available in both CMOS and N-channel open drain output configurations. Also detect logic is available in both RESETB (Active Low) and RESET (Active High).
Ultra-small low height package USPQ-4B05 and standard packages SSOT-24 and SOT-25 which are ideally suited for small design of portable devices and high densely mounting applications.
UVLO circuit is implemented in order to suppress the floating of RESETB pin (undefined operation) when V_{IN} voltage is lower than the minimum operating voltage.

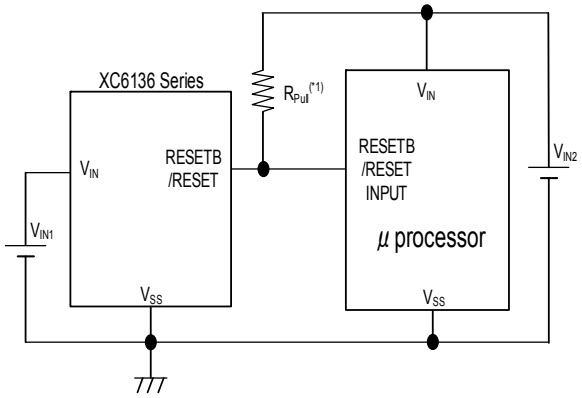
Features

Ultra-Low Power	: 91nA TYP.(@detect, V_{DF}=1.2V, V_{IN}=1.1V)
	: 88nA TYP.(@release, V_{DF}=1.2V, V_{IN}=1.32V)
High Accuracy	: ±0.8% (V_{DF}≦3.0V, Ta=25℃)
	±1.0% (3.1V≦V_{DF}, Ta=25℃)
	: ±2.5% (V_{DF}≦3.0V, Ta=-40℃～105℃)
	±2.7% (3.1V≦V_{DF}, Ta=-40℃～105℃)
Temperature Characteristics	: ±50ppm/℃ (TYP.)
Hysteresis Width	: TYPE:A/C V_{DF}×5.0% (TYP.)
	TYPE:B/D 2mV～28mV (TYP.)
Detect Voltage Range	: 1.2V～5.0V (0.1Vstep)
Operating Voltage Range	: 1.1V～6.0V
Output Type	: CMOS
	Nch open drain
Output Logic	: RESETB(Active Low)
	RESET(Active High)
Undefined Operation Protection (CMOS Output only)	: Output Pin Voltage 0.38V (MAX：Ta=-40℃～+105℃) @Power supply Input pin Voltage＜operating voltage(MIN.)
Packages	: USPQ-4B05,SSOT-24,SOT-25
Environment Friendly	: EU RoHS Compliant, Pb Free

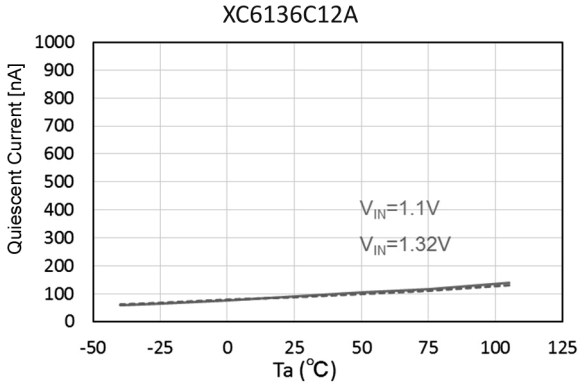
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6136①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	Nch open drain output
②③	Detect Voltage	12～50	e.g. 1.2V → ②=1, ③=2
④	Type	A	Reset Active Low / Hysteresis 5.0%(TYP.)
		B	Reset Active Low / Hysteresis 0.1%(TYP.)
		C	Reset Active High / Hysteresis 5.0%(TYP.)
		D	Reset Active High / Hysteresis 0.1%(TYP.)
⑤⑥-⑦(*1)	Packages (Order Unit)	9R-G	USPQ-4B05 (5,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel) Cu Wire

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

XC6135 Series

Ultra Low Power (44nA) Voltage Detector with Separated Sense Pin

RoHS Halogen Antimony FREE

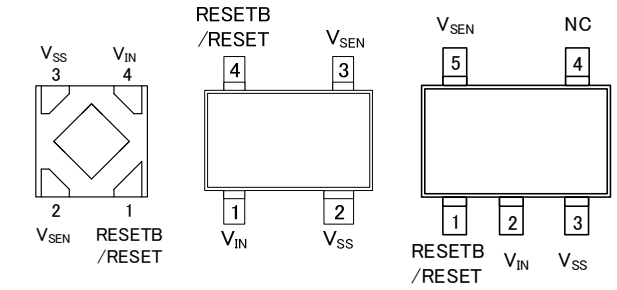
General Description

The XC6135 series is ultra-low power voltage detector with high accuracy detection, manufactured using CMOS process and laser trimming technologies.
Since the sense pin is separated from the power supply pin, it allows the IC to monitor the other power supply.
The XC6135 can maintain the state of detection even when voltage of the monitored power supply drops to 0V.
Sense Pin is also suited for detecting low voltages starting from 0.5V.
Ultra-small low height package USPQ-4B05 and standard packages SSOT-24 and SOT-25 which are ideally suited for small design of portable devices and high densely mounting applications.
UVLO circuit is implemented in order to suppress the floating of RESETB pin (undefined operation) when V_{IN} voltage is lower than the minimum operation voltage.

Features

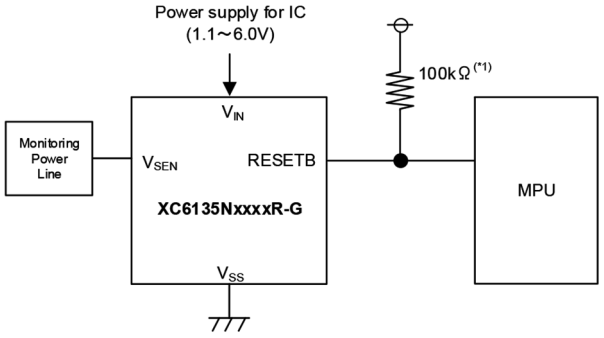
Ultra-Low Power : 53nA TYP.(@detection, V_{IN}=1.1V)
: 44nA TYP.(@released, V_{IN}=1.1V)
High Accuracy : ±10mV (0.5≦V_{DF}≦1.1V, Ta=25℃)
±0.8% (1.2≦V_{DF}≦3.0V, Ta=25℃)
±1.0% (3.1V≦V_{DF}≦5.0V, Ta=25℃)
: ±30mV (0.5≦V_{DF}≦1.1V, Ta=-40℃～+105℃)
±2.5% (1.2≦V_{DF}≦3.0V, Ta=-40℃～+105℃)
±2.7% (3.1V ≦ V_{DF} ≦ 5.0V, Ta=-40 ℃ ～+105℃)
Temperature Characteristics : ±50ppm/℃ (TYP.)
Hysteresis Width : TYPE:A/C V_{DF}×5.0% (TYP.)
TYPE:B/D 2mV～28mV (TYP.)
Detect Voltage Range : 0.5V～5.0V (0.1Vstep)
Operating Voltage Range : 1.1V～6.0V
Output Type : CMOS
Nch open drain
Output Logic : RESETB(Active Low)
RESET(Active High)
Undefined Operation Protection (CMOS Output only) : Output pin Voltage 0.38V (MAX：Ta=-40℃～+105℃) @Power supply Input pin Voltage＜Minimum operation Voltage
Packages : USPQ-4B05,SSOT-24,SOT-25
Environment Friendly : EU RoHS Compliant, Pb Free

Pin Configuration



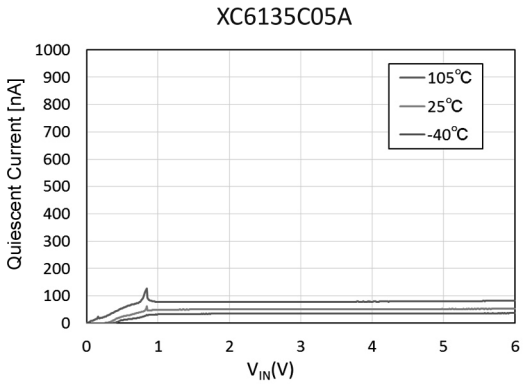
USPQ-4B05 (BOTTOM VIEW) SSOT-24 (TOP VIEW) SOT-25 (TOP VIEW)

Typical Application Circuit



(*1) Unused for the CMOS output products

Typical Performance Characteristics



Ordering Information

XC6135①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	Nch open drain output
②③	Detect Voltage	05～50	e.g. 0.5V → ②=0, ③=5
④	Type	A	Reset Active Low / Hysteresis 5.0%(TYP.)
		B	Reset Active Low / Hysteresis 0.1%(TYP.)
		C	Reset Active High / Hysteresis 5.0%(TYP.)
		D	Reset Active High / Hysteresis 0.1%(TYP.)
⑤⑥-⑦ (*1)	Packages (Order Unit)	9R-G	USPQ-4B05 (5,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel) Cu Wire

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

XC6134 Series

Delay Capacitor Adjustable Voltage Detectors with Sense Pin Isolation and Hysteresis External Adjustment

General Description

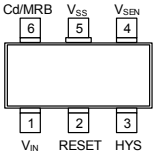
The XC6134 series are ultra-small delay capacitor adjustable type voltage detectors that have high accuracy and sense pin isolation. High accuracy and a low supply current are achieved by means of a CMOS process, a highly accurate reference power supply, and laser trimming technology.
The sense pin is isolated from the power input pin to enable monitoring of the voltage of another power supply. Output can be maintained in the detection state even if the voltage of the power supply that is monitored drops to 0V. The sense pin is also suitable for detecting high voltages, and the detection and release voltage can be set as desired using external resistors. An internal delay circuit is also provided. By connecting a capacitor to the Cd/MRB pin, any release delay time and detect delay time can be set, and the pin can also be used as a manual reset pin. The HYS external adjustment pin can be used to establish a sufficient hysteresis width.

Features

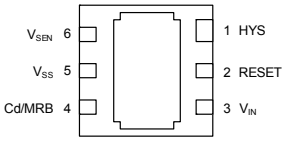
Operating Ambient Temperature:	-40℃～+125℃
Operating Voltage Rang:	1.6V～6.0V (Absolute Max. Rating: 7.0V)
Detect Voltage Range:	0.8V～5.0V
Detect Voltage Accuracy:	±18mV (V_{DF}＜1.5V)
(Ta=25℃)	±1.2% (1.5V≦V_{DF}≦3.0V) ±1.5% (3.1V≦V_{DF}≦5.0V)
Detect Voltage Accuracy:	±36mV (V_{DF}＜1.5V)
(Ta=-40～125℃)	±2.7% (1.5V≦V_{DF}≦3.0V) ±3.0% (3.1V≦V_{DF}≦5.0V)
Temperature Characteristics:	±50ppm/℃ (TYP.)
Hysteresis Width:	V_{DF}×0.1% (TYP.)
Adjustable Pin for Hysteresis Width:	Yes
Low Supply Current:	1.28μA (TYP.) V_{IN}=1.6V (At detection) 1.65μA (TYP.) V_{IN}=6.0V(At release)
Manual Reset Function:	Yes
Output Type:	CMOS or Nch open drain
Output Logic:	H level or L level at detection
Delay Capacitance Pin:	Release delay / detection delay can be set in 5 time ratio options
Packages:	USP-6C,SOT-26
Environmentally Friendly:	EU RoHS compliant, Pb free

Pin Configuration

●Type A/B/C/D/L

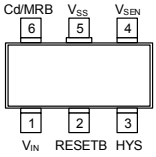


SOT-26
(TOP VIEW)

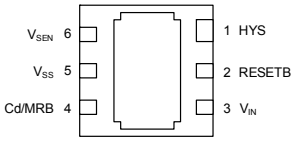


USP-6C
(BOTTOM VIEW)

●Type E/F/H/K/M

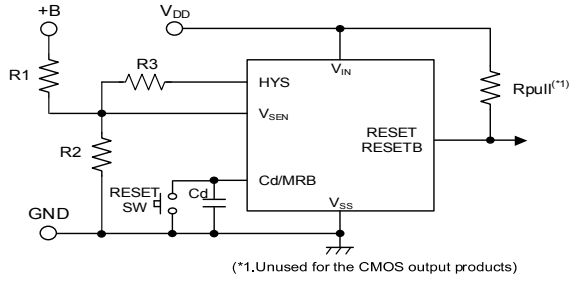


SOT-26
(TOP VIEW)



USP-6C
(BOTTOM VIEW)

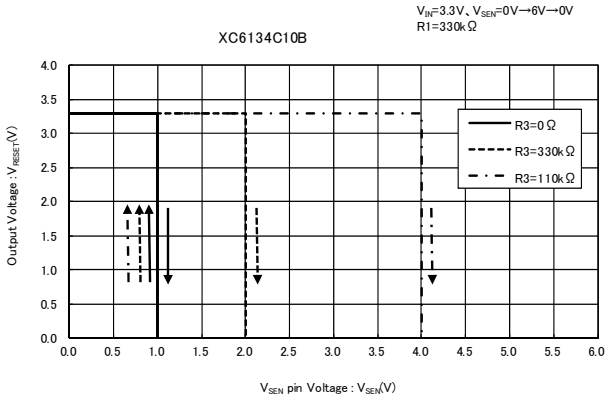
Typical Application Circuit



(*1,Unused for the CMOS output products)

Battery (+B) voltage monitoring: Detects high voltage by R1/R2 resistance dividing.
A hysteresis width can be added as desired by connecting R3 between the VSEN and HYS pins

Typical Performance Characteristics



Ordering Information

XC6134①②③④⑤⑥−⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	Nch open drain output
②③	Detect Voltage	08～50	e.g. 1.0V → ②=1, ③=0
④	Type	A～M	Refer to [Selection Guide]
⑤⑥−⑦(*1)	Packages (Order Unit)	MR-G	SOT-26 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	RESET/RESETB OUTPUT	DELAY (Rp:Rn)		HYSTERESIS
A	Active High(*2)	1:0	144kΩ:0Ω	0.1%(TYP.)
B	↑	1:0.125	144kΩ:18kΩ	↑
C	↑	1:1	144kΩ:144kΩ	↑
D	↑	2:1	288kΩ:144kΩ	↑
L	↑	0.076:1	11kΩ:144kΩ	↑
E	Active Low(*2)	1:0	144kΩ:0Ω	↑
F	↑	1:0.125	144kΩ:18kΩ	↑
H	↑	1:1	144kΩ:144kΩ	↑
K	↑	2:1	288kΩ:144kΩ	↑
M	↑	0.076 : 1	11kΩ : 144kΩ	↑

(*2) "Active High" is H level when detection occurs, and "Active Low" is L level when detection occurs.

XC6133 Series

Capacitor Delay Type Voltage Detectors with Sense Pin Isolation

RoHS Halogen Antimony FREE

General Description

The XC6133 series are ultra-small delay capacitor adjustable type voltage detectors that have high accuracy and sense pin isolation. High accuracy and a low supply current are achieved by means of a CMOS process, a highly accurate reference power supply, and laser trimming technology.

The sense pin is isolated from the power input pin to enable monitoring of the voltage of another power supply. Output can be maintained in the detection state even if the voltage of the power supply that is monitored drops to 0V. The sense pin is also suitable for detecting high voltages, and the detection and release voltage can be set as desired using external resistors.

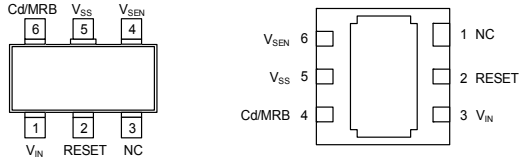
An internal delay circuit is also provided. By connecting a capacitor to the Cd/MRB pin, any release delay time and detect delay time can be set, and the pin can also be used as a manual reset pin.

Features

Operating Ambient Temperature: -40℃～+125℃
Operating Voltage Range: 1.6V～6.0V
(Absolute Max. Rating: 7.0V)
Detect Voltage Range 1.0V～5.0V
Detect Voltage Accuracy: ±18mV (V_{DF}＜1.5V)
(Ta=25℃) ±1.2% (1.5V≦V_{DF}≦3.0V)
±1.5% (3.1V≦V_{DF}≦5.0V)
Detect Voltage Accuracy: ±36mV (V_{DF}＜1.5V)
(Ta=-40～125℃) ±2.7% (1.5V≦V_{DF}≦3.0V)
±3.0% (3.1V≦V_{DF}≦5.0V)
Temperature Characteristics: ±50ppm/℃ (TYP.)
Hysteresis Width: V_{DF}×5.0% (TYP.)
Low Supply Current: 1.28μA (TYP.)
V_{IN}=1.6V (At detection)
1.65μA (TYP.)
V_{IN}=6.0V (At release)
Manual Reset Function: Yes
Output Type: CMOS or Nch open drain
Output Logic: H level or L level at detection
Delay Capacitance Pin: Release delay / detection delay can be set in 5 time ratio options
Packages: USP-6C,SOT-26
Environmentally Friendly: EU RoHS compliant, Pb free

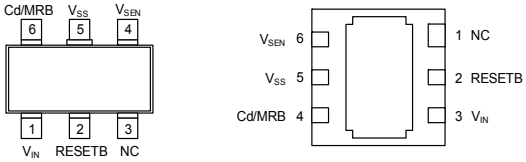
Pin Configuration

●Type A/B/C/D/L



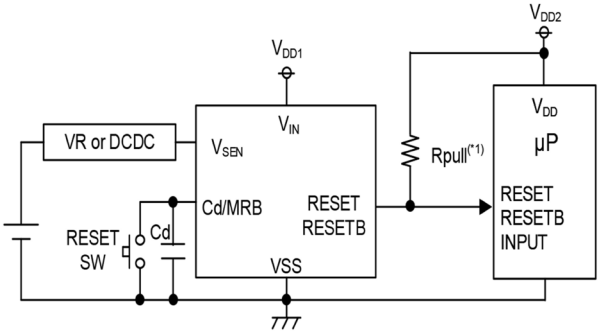
SOT-26 (TOP VIEW)　USP-6C (BOTTOM VIEW)

●Type E/F/H/K/M



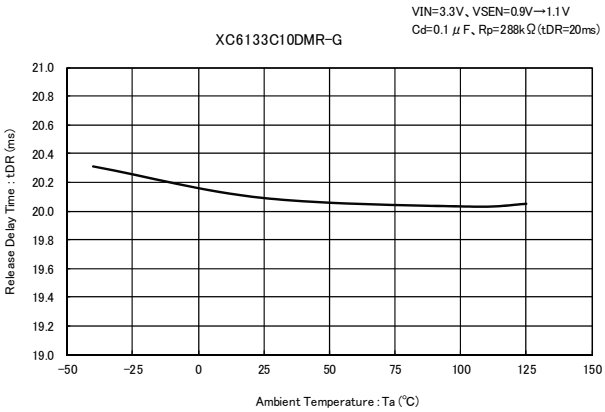
SOT-26 (TOP VIEW)　USP-6C (BOTTOM VIEW)

Typical Application Circuit



(*1.Unused for the CMOS output products)

Typical Performance Characteristics



Ordering Information

XC6133①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	Nch open drain output
②③	Detect Voltage	10～50	e.g. 1.0V → ②=1, ③=0
④	Type	A～M	Refer to [Selection Guide]
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-26 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	RESET/RESETB OUTPUT	DELAY (Rp:Rn)		HYSTERESIS
A	Active High(*2)	1:0	144kΩ:0Ω	5.0%(TYP.)
B	↑	1:0.125	144kΩ:18kΩ	↑
C	↑	1:1	144kΩ:144kΩ	↑
D	↑	2:1	288kΩ:144kΩ	↑
L	↑	0.076:1	11kΩ:144kΩ	↑
E	Active Low(*2)	1:0	144kΩ:0Ω	↑
F	↑	1:0.125	144kΩ:18kΩ	↑
H	↑	1:1	144kΩ:144kΩ	↑
K	↑	2:1	288kΩ:144kΩ	↑
M	↑	0.076 : 1	11kΩ : 144kΩ	↑

(*2) "Active High" is H level when detection occurs, and "Active Low" is L level when detection occurs.

XC6132 Series

Delay Capacitor Adjustable, Sense Pin Isolation, Surge Voltage Protection and Hysteresis Rxternal Adjustment

General Description

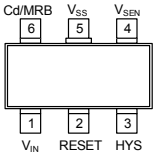
The XC6132 series are ultra-small delay capacitor adjustable type voltage detectors that have high accuracy and sense pin isolation. High accuracy and a low supply current are achieved by means of a CMOS process, a highly accurate reference power supply, and laser trimming technology.
The sense pin is isolated from the power input pin to enable monitoring of the voltage of another power supply. Output can be maintained in the detection state even if the voltage of the power supply that is monitored drops to 0V. The sense pin is also suitable for detecting high voltages, and the detection and release voltage can be set as desired using external resistors. An internal surge voltage protection circuit and an internal delay circuit are also provided.
By connecting a capacitor to the Cd/MRB pin, any release delay time and detect delay time can be set and the pin can also be used as a manual reset pin.
The HYS external adjustment pin can be used to establish a sufficient hysteresis width.

Features

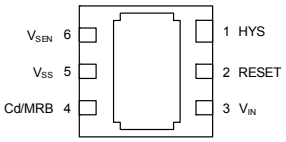
Operating Ambient Temperature:	-40℃～+125℃
Operating voltage range:	1.6V～6.0V (Absolute Max. Rating: 7.0V)
Detect voltage range:	0.8V～2.0V
Detect voltage accuracy:	±18mV(V_{DF}＜1.5V)
(Ta=25℃)	±1.2%(1.5V≦V_{DF}≦2.0V)
Detect voltage accuracy:	±36mV(V_{DF}＜1.5V)
(Ta=-40～125℃)	±2.7%(1.5V≦V_{DF}≦2.0V)
Temperature Characteristics:	±50ppm/℃(TYP.)
Hysteresis width:	V_{DF}×0.1%(TYP.)
Adjustable Pin for Hysteresis Width:	Yes
Low supply current:	1.28μA(TYP.) V_{IN}=1.6V(At detection) 1.65μA(TYP.) V_{IN}=6.0V(At release)
Manual reset function:	Yes
Output type:	CMOS or N-ch open drain
Output logic:	H level or L level at detection
Delay capacitance pin:	Release delay / detection delay can be set in 5 time ratio options
Sense pin:	Includes a surge voltage protection function
Packages:	USP-6C,SOT-26
Environmentally Friendly:	EU RoHS compliant, Pb free

Pin Configuration

●A/B/C/D/L type

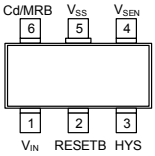


SOT-26
(TOP VIEW)

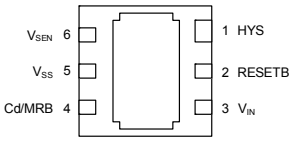


USP-6C
(BOTTOM VIEW)

●E/F/H/K/M type

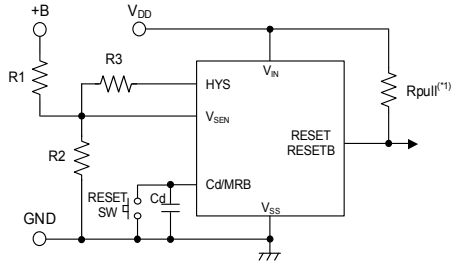


SOT-26
(TOP VIEW)



USP-6C
(BOTTOM VIEW)

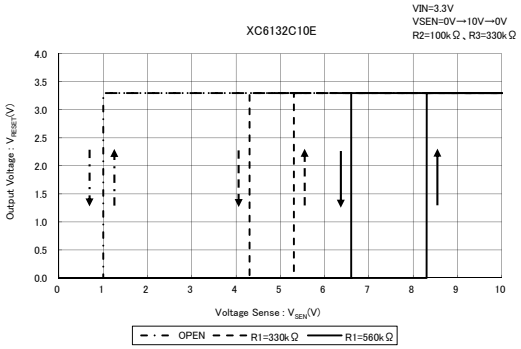
Typical Application Circuit



(*1.Unused for the CMOS output products)

Battery (+B) voltage monitoring: Detects high voltage via R1/R2 resistance division.
A hysteresis width can be added as desired by connecting R3 between the V_{SEN} and HYS pins

Typical Performance Characteristics



Ordering Information

XC6132①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage	08～20	e.g. 1.0V → ②=1, ③=0
④	Type	A～M	Refer to Selection Guide
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-26 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	RESET/RESETB OUTPUT	DELAY(Rp:Rn)		HYSTERESIS
A	Active High(*2)	1:0	144kΩ:0Ω	0.1%(TYP.)
B	↑	1:0.125	144kΩ:18kΩ	↑
C	↑	1:1	144kΩ:144kΩ	↑
D	↑	2:1	288kΩ:144kΩ	↑
L	↑	0.076:1	11kΩ:144kΩ	↑
E	Active Low(*2)	1:0	144kΩ:0Ω	↑
F	↑	1:0.125	144kΩ:18kΩ	↑
H	↑	1:1	144kΩ:144kΩ	↑
K	↑	2:1	288kΩ:144kΩ	↑
M	↑	0.076:1	11kΩ:144kΩ	↑

(*2) "Active High" is H level when detection occurs, and "Active Low" is L level when detection occurs.

XC6130/XC6131 Series

Watchdog Timeout Period Externally Adjustable Voltage Detector (Operating Ambient Temperature: -40℃～+125℃)

RoHS Halogen Antimony FREE

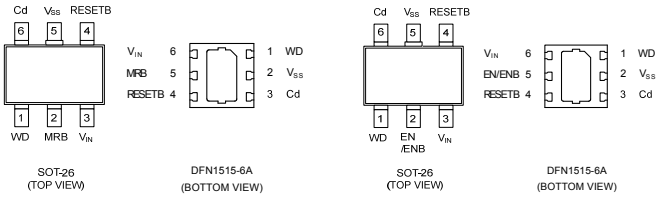
General Description

The XC6130/XC6131 series is voltage detector with watchdog function.
A release delay time and watchdog timeout period can be adjusted by one external capacitor.
The series is used for monitoring of microprocessor. When the power supply voltage reaches voltage or the pulse from Low to High is not input into a watchdog pin within watchdog timeout period, Low signal outputs from RESETB pin.
The XC6130 has manual reset function. When the manual reset pin goes low, low level signal outputs from RESETB pin and reset can be asserted at any time.
The XC6131 has ON/OFF control of the watchdog function. By setting the EN pin to low level, the watchdog function can be OFF while the voltage detector remains operation. Since the EN pin internally pulled up, the ICs can be used with there pins left open for not use.

Features

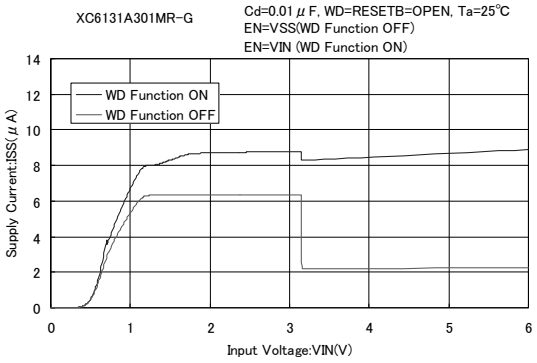
Operating Voltage Range: 1.5V～6.0V (Absolute Max. Rating: 7.0V)
Detect Voltage: 1.6V～5.0V (±1.0%: SOT-26, ±1.5% : DFN1515-6A)
Hysteresis Width : V_{DFL}×5%
Low Quiescent Current: 8.1μA Detected
9.8μA Released
2.5μA Released (EN=L)
Functions: Manual Reset (XC6130)
Watchdog ON/OFF Function (XC6131)
Watchdog Timeout Period : 100ms (Cd=0.1μF)
Release Delay Time : 100ms (Cd=0.1μF) (Power-on State)
10ms (Cd=0.1μF) (After Watchdog Timeout)
Operating Ambient Temperature: -40℃～+125℃
Package: SOT-26, DFN1515-6A
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



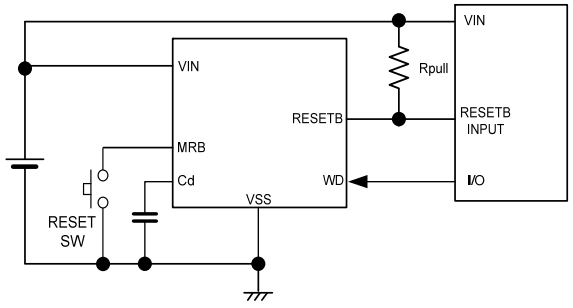
XC6130 Series XC6131 Series

Typical Performance Characteristics

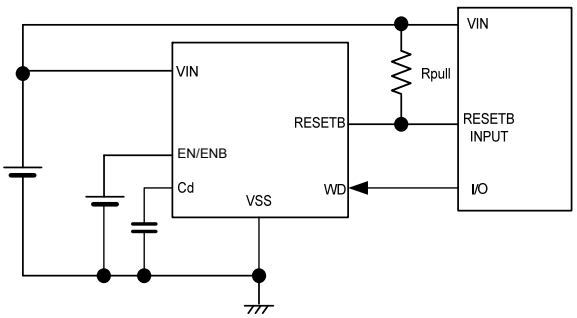


Typical Application Circuits

XC6130 Series



XC6131 Series



Ordering Information

XC6130①②③④⑤⑥-⑦ With MRB Pin (Manual Reset)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	MRB pin With pull-up resistor
②③	Detect Voltage	16～50	e.g. 1.6V → ②=1, ③=6
④	Detect Accuracy	1	±1.0% (SOT-26)
⑤⑥-⑦ (*1)	Package (Order Unit)	A	±1.5% (DFN1515-6A)
		MR-G	SOT-26 (3000pcs/Reel) (*2)
		6R-G	DFN1515-6A (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) The SOT-26 reels are shipped in a moisture-proof packing.

XC6131①②③④⑤⑥-⑦ With EN pin (Watchdog Disable)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	EN pin With pull-up resistor
		B	ENB pin With pull-down resistor
②③	Detect Voltage	16～50	e.g. 1.6V → ②=1, ③=6
④	Detect Accuracy	1	±1.0%
⑤⑥-⑦ (*1)	Package (Order Unit)	A	±1.5% (DFN1515-6A)
		MR-G	SOT-26 (3000pcs/Reel) (*2)
		6R-G	DFN1515-6A (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) The SOT-26 reels are shipped in a moisture-proof packing.

XC6129 Series

Voltage Detector with Delay Time Adjustable

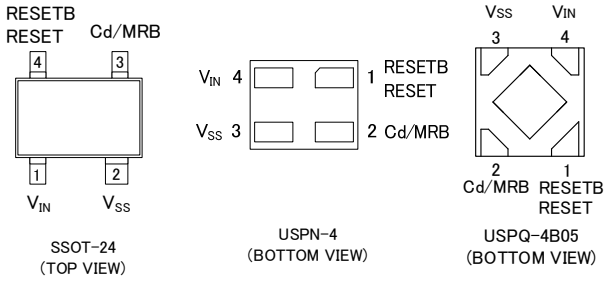
General Description

XC6129 series is an ultra small highly accurate voltage detector with external capacitor type delay function.
The device includes a highly accurate reference voltage source, manufactured using CMOS process and laser trimming technology, it maintains low power consumption and high accuracy. The device includes the built-in delay circuit. A release delay time or detect delay time can be set freely by connecting an external delay capacitor to Cd pin.
There are two kinds of the output configuration for the XC6129 such as CMOS or N-channel open drain. The series has a function to prevent an indefinite operation. Therefore, when the input pin voltage is under minimum operating voltage,
the function controls an output pin voltage in the indefinite operation less than 0.4V (MAX.). Also, the series allows a choice of an output logic when detection; therefore, it is suitable for various electric devices using Microcontrollers.
Ultra small package USPN-4, SSOT-24 (standard) and USPQ-4B05 are ideally suited for small design of portable devices and high densely mounting applications.

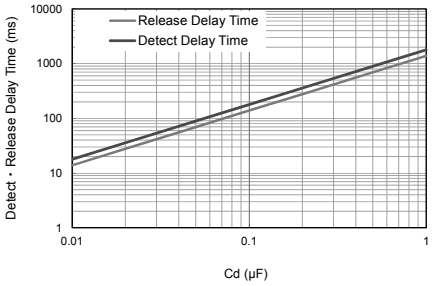
Features

High Accuracy:	±0.8%
Temperature Characteristic:	±50ppm/℃ (TYP.)
Hysteresis Width:	V_{DF} × 5% (TYP.)
Quiescent Current :	0.42μA TYP. (at Detect V_{IN}=2.7V) 0.58μA TYP. (at Release V_{IN}=2.7V)
Detect Voltage Range:	1.5V～5.5V (0.1V increments)
Input Voltage Range:	1.3V～6.0V (Absolute Max. Rating: 6.5V)
Output Configuration:	CMOS or N-channel Open Drain
Output Logic:	Active High or Active Low (at Detect)
Release Delay Time:	13.9ms (Cd=0.01μF, R_P=2MΩ)
Detect Delay Time:	17.9ms (Cd=0.01μF, Rn=2MΩ)
Manual Reset Function:	Cd Pin "Low" makes V_{OUT} "Low"
Operating Ambient Temperature:	-40℃～+85℃
Packages:	USPN-4, SSOT-24, USPQ-4B05
Environmentally Friendly:	EU RoHS Compliant, Pb Free

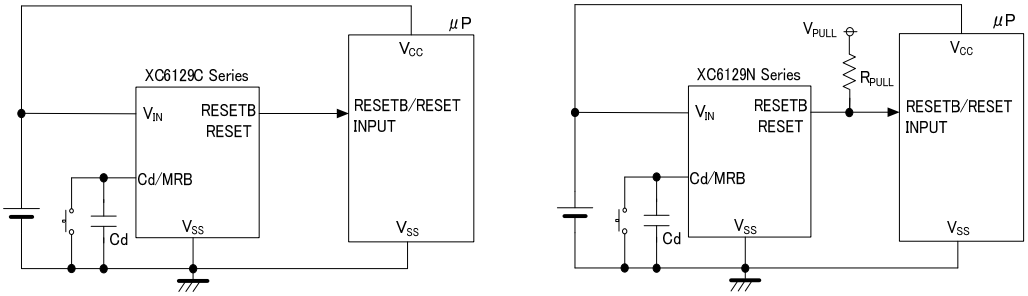
Pin Configuration



Typical Performance Characteristics



Typical Application Circuit



Ordering Information

XC6129①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	Nch open drain output
②③	Detect Voltage	15~55	e.g. 1.8V → ②=1, ③=8
④	Type	A	Refer to [Selection Guide]
		B	
		C	
		D	
		E	
		F	
		G	
		J	
		L	
⑤⑥-⑦(*1)	Packages (Order Unit)	NR-G	SSOT-24 (3,000pcs/Reel)
		9R-G	USPQ-4B05 (5,000pcs/Reel)
		7R-G	USPN-4 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT LOGIC	RELEASE DELAY	DETECT DELAY	HYSTERESIS WIDTH	INDEFINITENESS PREVENTION
A	Reset Active Low	Yes	No	5% (TYP.)	Not Available
B				5% (TYP.)	Available
C		No	Yes	5% (TYP.)	Not Available
D				5% (TYP.)	Available
E		Yes	Yes	5% (TYP.)	Not Available
F				5% (TYP.)	Available
G	Reset Active High	Yes	No	5% (TYP.)	Not Available
J		No	Yes	5% (TYP.)	
L		Yes	Yes	5% (TYP.)	

XC6127 Series

Ultra Small Voltage Detector with High Precision Delay Circuit and Manual Reset Function

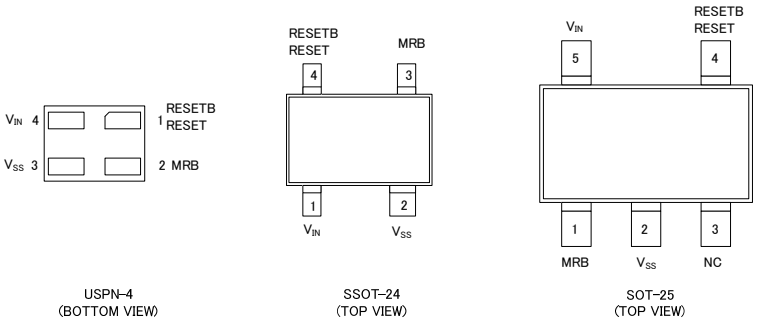
General Description

XC6127 series is ultra small highly accurate voltage detector with delay circuit built-in.
The device includes a highly accurate reference voltage source, manufactured using CMOS process technology and laser trimming technologies, it maintains high accuracy, low quiescent current, and accurate releases delay time over the full operation temperature range.
The release delay time periods are internally set in a range from 50ms to 800ms.
Moreover, with the manual reset function, reset can be asserted at any time.
The device is available in both CMOS and N-channel open drain output configurations. Also detect logic is available in both RESETB (Active Low) and RESET (Active High).
Ultra small package USPN-4 is ideally suited for small design of portable devices and high densely mounting applications. The conventional packages SSOT-24, SOT-25 is also available for upper compatible replacements.

Features

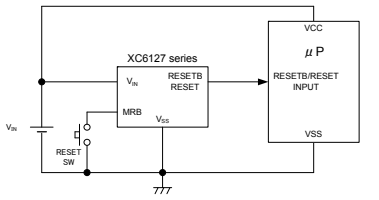
High Accuracy: ±0.8%
Temperature Characteristics: ±50ppm/℃
Low Quiescent Current:
0.6μA TYP. (Detect: V_{DF}=1.8V, V_{IN}=1.62V)
0.7μA TYP. (Release: V_{DF}=1.8V, V_{IN}=1.98V)
Operating Voltage Range:
0.7V～6.0V (Absolute Max. Rating: 6.5V)
Detect Voltage Range: 1.5V～5.5V (0.1V increments)
Manual Reset Input: MRB Pin (Built-in Pull-up resistance)
Output Configuration: N-channel open drain or CMOS output
Output Logic: RESETB (Active Low)
RESET (Active High)
Release Delay Time: 50ms/100ms/200ms/400ms/800ms±15%
Operating Ambient Temperature: -40℃~+85℃
Packages: USPN-4, SSOT-24, SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

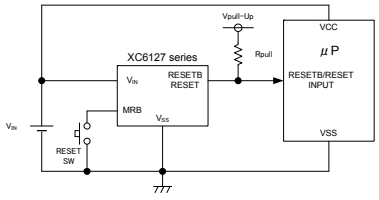


USPN-4 (BOTTOM VIEW) SSOT-24 (TOP VIEW) SOT-25 (TOP VIEW)

Typical Application Circuit

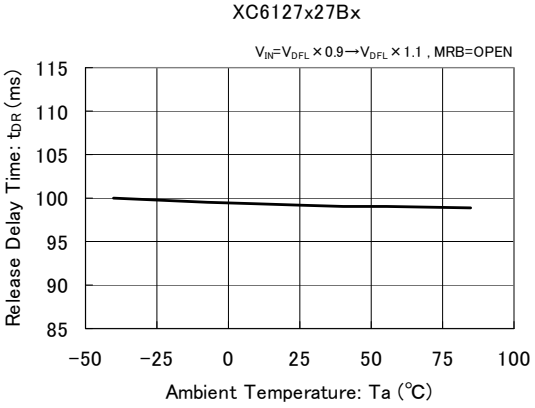


CMOS output



N-ch open drain output

Typical Performance Characteristics



Ordering Information

XC6127①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage	15～55	e.g. 2.7V →②=2, ③=7
④	Type	A	Reset Active Low, Release Delay Time: 50ms
		B	Reset Active Low, Release Delay Time: 100ms
		C	Reset Active Low, Release Delay Time: 200ms
		D	Reset Active Low, Release Delay Time: 400ms
		E	Reset Active Low, Release Delay Time: 800ms
		F	Reset Active High, Release Delay Time: 50ms
		G	Reset Active High, Release Delay Time: 100ms
		H	Reset Active High, Release Delay Time: 200ms
		J	Reset Active High, Release Delay Time: 400ms
		K	Reset Active High, Release Delay Time: 800ms
⑤⑥-⑦(*1)	Packages (Order Unit)	7R-G	USPN-4 (5,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6126 Series

Ultra Small, Highly Accurate, Single Voltage Detector

RoHS Halogen Antimony FREE

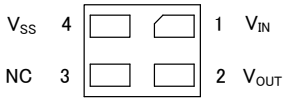
General Description

The XC6126 series is an ultra small, highly accurate CMOS single voltage detector with very low quiescent current. The device includes a highly accurate reference voltage source and uses laser trimming technologies, it maintains high accuracy over the full operation temperature range.
The device is available in both CMOS and N-channel open drain output configurations.
Ultra small package USPN-4B02 is ideally suited for small design of portable devices and high densely mounting applications. The conventional package SSOT-24 is also available for upper compatible replacements.

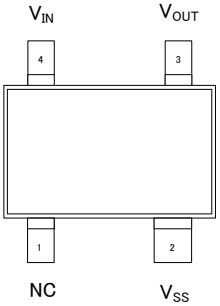
Features

High Accuracy: ±0.8%
Temperature Characteristics: ±50ppm/℃(TYP)
Low Quiescent Current:
0.6μA (Detect: V_{DF}=1.8V, V_{IN}=1.62V)(TYP.)
0.7μA (Release: V_{DF}=1.8V, V_{IN}=1.98V)(TYP.)
Operating Voltage Range:
0.7V～6.0V (Absolute Max. Rating: 6.5V)
Detect Voltage Range: 1.5V～5.5V (0.1V increments)
Output Configuration: N-ch open drain output
CMOS output
Detect Logic: Active Low Reset
Operating Ambient Temperature: -40～+85℃
Packages: USPN-4B02, SSOT-24
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

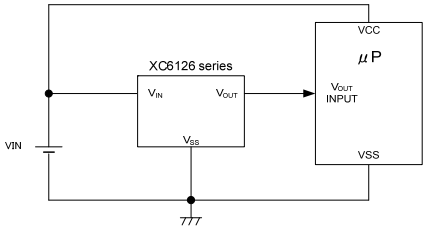


USPN-4B02
(BOTTOM VIEW)

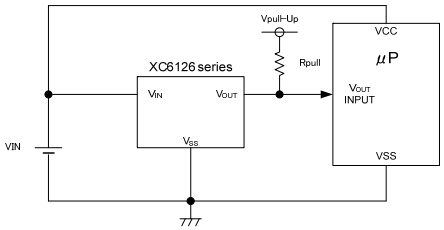


SSOT-24
(TOP VIEW)

Typical Application Circuit



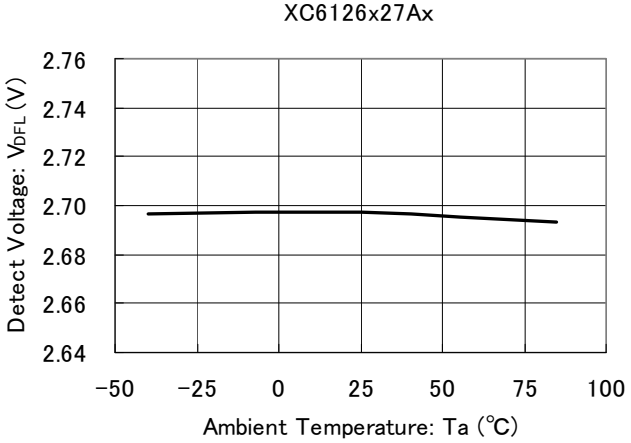
CMOS output



N-ch open drain output

Typical Performance Characteristics

Detect Voltage vs. Ambient Temperature



Ordering Information

XC6126①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS Output
		N	N-ch Open Drain Output
②③	Detect Voltage	15~55	e.g. 2.7V →②=2, ③=7
④	Detect Accuracy	A	±0.8%
⑤⑥-⑦(*1)	Packages (Order Unit)	7R-G	USPN-4B02 (5,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6121/XC6122/XC6123/XC6124 Series

RoHS Halogen Antimony FREE

Voltage Detector with Watchdog Function and ON/OFF Control (V_{DF}=1.6V~5.0V)

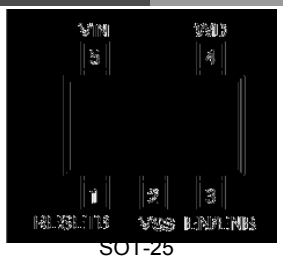
General Description

The XC6121/XC6122/XC6123/XC6124 series are groups of high-precision, low current consumption voltage detectors with watchdog functions incorporating CMOS process technology. The series consist of a reference voltage source, delay circuit, comparator, and output driver. With the built-in delay circuit, the XC6121/XC6122/XC6123/XC6124 series' ICs do not require any external components to output signals with release delay time. The output type is VDFL low when detected. With the XC6121/XC6122/XC6123/XC6124 series' ICs, the EN/ENB pin can control ON and OFF of the watchdog functions. By setting the EN/ENB pin to low or high level, the watchdog function can be OFF while the voltage detector remains operation. Since the EN/ENB pin of the XC6122 and XC6124 series is internally pulled up to the VIN pin or pulled down to the VSS pin, the ICs can be used with the EN/ENB pin left open, when the watchdog functions is used. The detect voltages are internally fixed 1.6V ~ 5.0V in increments of 0.1V, using laser trimming technology. Six watchdog timeout period settings are available in a range from 50ms to 1.6s. Five release delay time settings are available in a range from 3.13ms to 400ms.

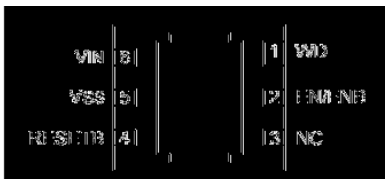
Features

Detect Voltage Range: 1.6V ~ 5.0V, +2.0% (0.1V increments)
Hysteresis Width: V_{DFL} x 5% (TYP.)
Operating Voltage Range: 1.0V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Detect Voltage Temperature Characteristics:
+100ppm/°C (TYP.)
Output Configuration: N-channel open drain
WD Pin: Watchdog input
EN/ENB Pin: The watchdog function is forced off.
Release Delay Time: 400ms, 200ms, 100ms, 50ms, 3.13ms (TYP.)
Watchdog Timeout Period: 1.6s, 800ms, 400ms, 200ms, 100ms, 50ms (TYP.)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

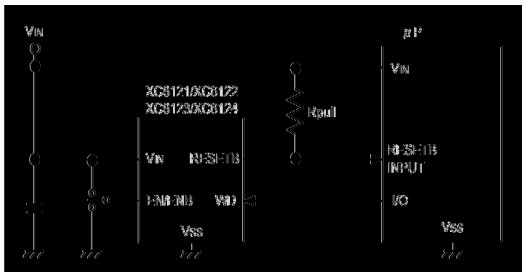


SOT-25
(TOP VIEW)



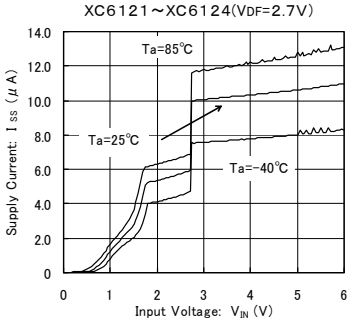
USP-6C
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Supply Current vs. Input Voltage



Ordering Information

XC6121①②③④⑤⑥-⑦: EN Pin: No Pull-Up Resistor
XC6122①②③④⑤⑥-⑦: EN Pin: Pull-Up Resistor
XC6123①②③④⑤⑥-⑦: ENB Pin: No Pull-Down Resistor
XC6124①②③④⑤⑥-⑦: ENB Pin: Pull-Down Resistor

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Release Delay Time(*1)	A	3.13ms (TYP.)
		C	50ms (TYP.)
		D	100ms (TYP.)
		E	200ms (TYP.)
		F	400ms (TYP.)
②	Watchdog Timeout Period	2	50ms (TYP.)
		3	100ms (TYP.)
		4	200ms (TYP.)
		5	400ms (TYP.)
		6	1.6s (TYP.)
		7	800ms (TYP.)
③④	Detect Voltage	16 ~ 50	Detect voltage ex.) 4.5V: ③⇒ 4, ④⇒ 5
⑤⑥-⑦(*2)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) Please set the release delay time shorter than or equal to the watchdog timeout period.
ex.) XC6121D327MR-G or XC6121D627MR-G

(*2) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6120 Series

Ultra Small, Low Quiescent Current Voltage Detector

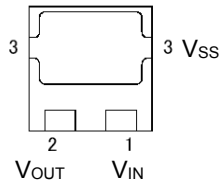
General Description

The XC6120 series are highly precise, low quiescent current voltage detectors, manufactured using CMOS and laser trimming technologies. With low quiescent current and high accuracy, the series is suitable for precision mobile equipment.
The series' ultra small packages are best suited for high-density mounting. Both CMOS and N-channel open drain output configurations are available.

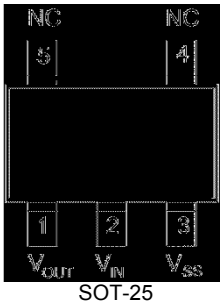
Features

Accuracy: ± 2.0% ($V_{DF} \geqq 1.5V$)
± 30mV (V_{DF}<1.5V)
Low Quiescent Current: 0.6μA (TYP.) [V_{DF}=2.7V, V_{IN}2.97V]
Detect Voltage Range: 1.0V ~ 5.0V (0.1V increments)
Operating Voltage Range: 0.7V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Detect Voltage Temperature Characteristics:
±100ppm/℃ (TYP.)
Output Configuration: N-channel open drain or CMOS
Operating Ambient Temperature: -40℃~+85℃
Packages: USP-3, SOT-25, SSOT-24
Environmentally Friendly: EU RoHS Compliant, Pb Free

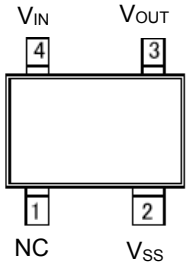
Pin Configuration



USP-3
(BOTTOM VIEW)

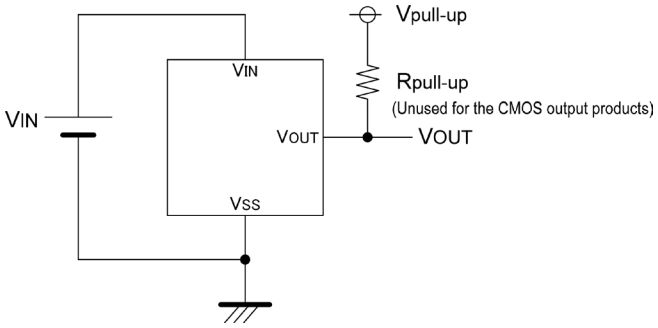


SOT-25
(TOP VIEW)



SSOT-24
(TOP VIEW)

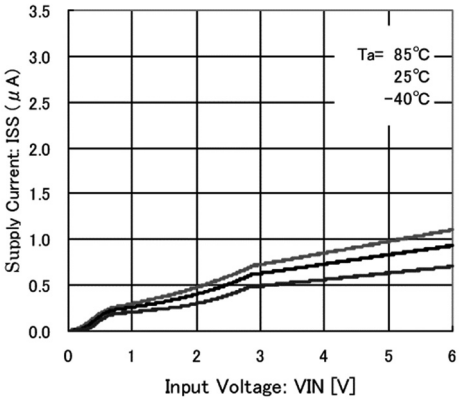
Typical Application Circuit



Typical Performance Characteristics

●Supply Current vs. Input Voltage

XC6120N272xx



Ordering Information

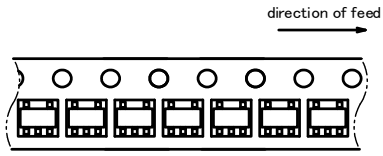
XC6120①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage (V_{DF})	10~50	e.g.1.0V → ②1, ③0
④	Detect Accuracy	2	±2.0%
⑤⑥-⑦(*1)	Packages (Order Unit)	HR-G	USP-3 (3,000pcs/Reel)
		SR-G	SOT-25 (3,000pcs/Reel) Standard feed(*2)
		NR-G	SSOT-24 (3,000pcs/Reel)
		SL-G	SOT-25 (3,000pcs/Reel) Reverse feed(*2)

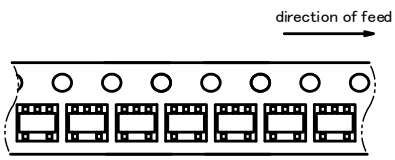
(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) SOT-25 uses Cu wires.

●Taping Specification

・SR-G



・SL-G



XC6119 Series

Voltage Detector with Delay Time Adjustable

RoHS FREE Halogen Antimony FREE

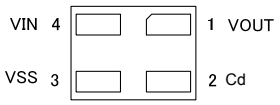
General Description

The XC6119 series is highly precise, low quiescent current voltage detector, manufactured using CMOS and laser trimming technologies.
With the built-in delay circuit, connecting the delay capacitance pin to the capacitor enables the IC to provide an arbitrary release delay time.
Both CMOS and N-channel open drain output configurations are available.

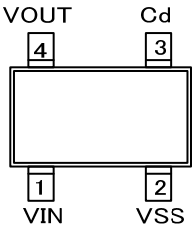
Features

Accuracy: ±2.0%(Voltage Accuracy≧1.5V)
±30mV(Voltage Acuracy＜1.5V)
Ultra Low Quiescent Current : 0.9μA(TYP. VDF=1.0V, VIN=1.1V)
Detect Voltage Range: 0.8V ~ 5.0V (0.1V increments)
Operating Voltage Range: 0.7V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Detect Voltage Temperature Characteristics: ±100ppm/℃(TYP.)
Output Configuration: CMOS or N-channel open drain
Operating Ambient Temperature: -40℃ ~ +85℃
Packages: USPN-4, SSOT-24
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



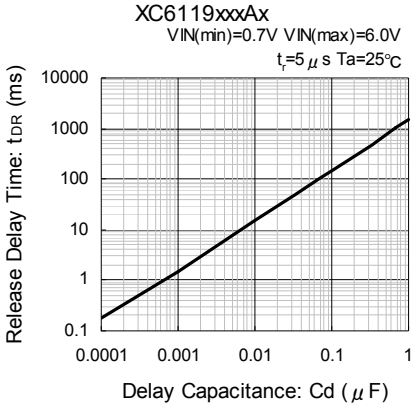
USPN-4
(BOTTOM VIEW)



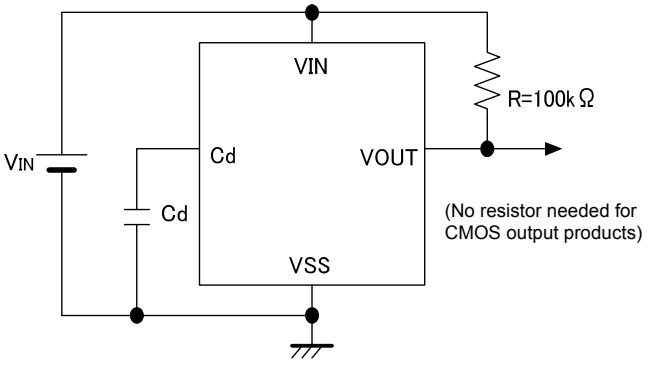
SSOT-24
(TOP VIEW)

Typical Performance Characteristics

●Release Delay Time vs. Delay Capacitance



Typical Application Circuit



Ordering Information

XC6119①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage	08~50	e.g. 18→1.8V
④	Output Delay & Hysteresis	A	Built-in delay pin & hysteresis 5%
⑤⑥-⑦(*1)	Packages (Order Unit)	7R-G	USPN-4 (5,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6118 Series

Voltage Detector with Separated Sense Pin & Delay Capacitor

RoHS Halogen Antimony FREE

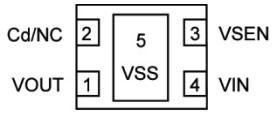
General Description

The XC6118 series is highly precise, low quiescent current voltage detector, manufactured with CMOS process and laser trimming technologies.
Since the sense pin is separated from power supply, it allows the IC to monitor added power supply.
Moreover, with the built-in delay circuit, connecting the delay capacitance pin to the capacitor enables the IC to provide an arbitrary release delay time.
Both CMOS and N-channel open drain output configurations are available.

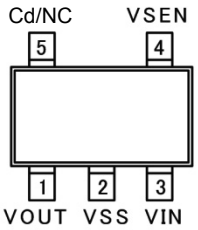
Features

Accuracy: ±2.0%(Detect Voltage≧1.5V)
±30mV(Detect Voltage＜1.5V)
Ultra Low Quiescent Current: 0.8μA(TYP.)(V_{IN}=2.0V)
Detect Voltage Range: 0.8V ~ 5.0V(0.1V increments)
Operating Voltage Range: 1.0V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Detect Voltage Temperature Characteristics : ±100ppm/℃(TYP.)
Output Configuration: CMOS or N-channel open drain
Operating Ambient Temperature: -40℃ ~ +85℃
Packages: USP-4, SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



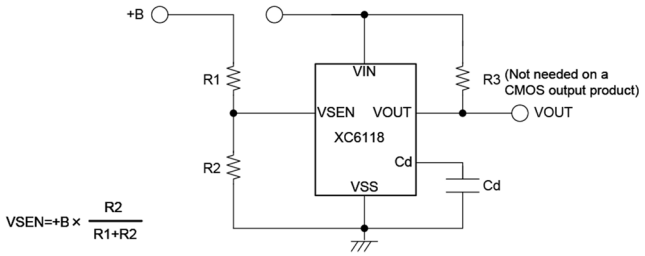
USP-4
(BOTTOM VIEW)



SOT-25
(TOP VIEW)

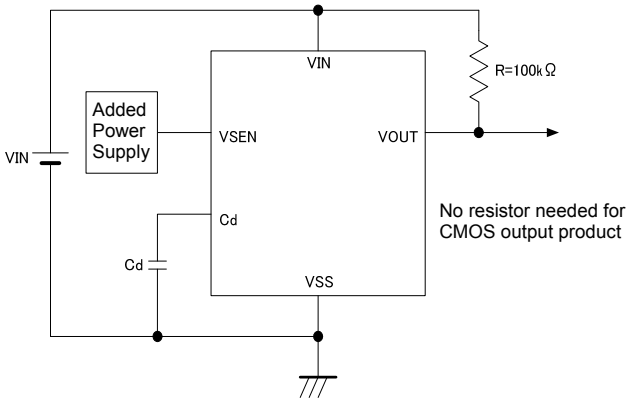
High Voltage Detect Circuit

Example: When 12V (+B: battery voltage) is detected, detection is possible with detection voltage (VSEN) = 1.0V, R1 = 220kΩ, and R2 = 20kΩ.
VIN = 1V to 6V: This is the IC power supply, so turn on the power at the same time or before VSEN. It is acceptable if the voltage applied to the VSEN pin is higher than VIN.



Use with R2 < RSEN. *RSEN is an internal sensor resistor in the IC.
The operating voltage of the VSEN pin is 6V, so set to 6V or less.

Typical Application Circuit



Ordering Information

XC6118①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage	08~50	e.g. 18→1.8V
④	Output Delay & Hysteresis (Options)	A	Built-in delay pin, hysteresis 5% (TYP.)
		B	Built-in delay pin, hysteresis less than 1%
		C	No built-in delay pin, hysteresis 5% (TYP.) (Semi-Custom)
		D	No built-in delay pin, hysteresis less than 1% (Semi-Custom)
⑤⑥-⑦(*1)	Packages (Order Unit)	GR-G	USP-4 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC61F/XC61H Series

Voltage Detectors (Delay Circuit Built-in)

RoHS Compliant, Halogen Antimony FREE

General Description

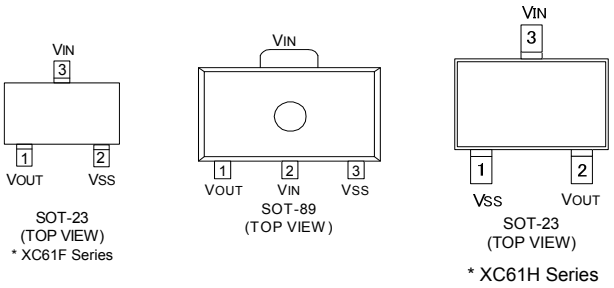
The XC61F/XC61H series are highly accurate, low quiescent current voltage detectors, manufactured using CMOS and laser trimming technologies.
A delay circuit is built-in to each detector.
Detect voltage is accurate with minimal temperature drift.
Both CMOS and N channel open drain output configurations are available.
Since the delay circuit is built-in, an external delay-time capacitor is not necessary so that high density mounting is possible.

Features

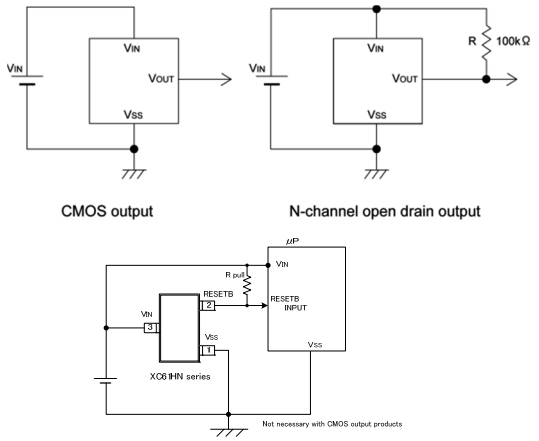
Accuracy: ± 2.0%
Low Quiescent Current: 1.0 μA (TYP.) [VIN=2.0V]
Detect Voltage Range: 1.6V ~ 6.0V (0.1V increments)
Operating Voltage Range: 0.7V ~ 10.0V
(Absolute Max. Rating: 12.0V)
Detect Voltage Temperature Characteristics: ± 100ppm/°C(TYP.)
Built-in Delay Circuit: 1ms ~ 50ms, 50ms ~ 200ms,
80ms ~ 400ms
Output Configuration: N-channel open drain or CMOS
Operating Ambient Temperature: -30°C ~ +80°C
Packages: XC61F (SOT-23, SOT-89)
XC61H (SOT-23)
Environmentally Friendly: EU RoHS Compliant, Pb Free

* No parts are available with an accuracy of ± 1%

Pin Configuration



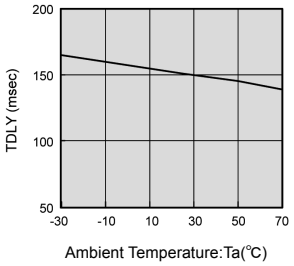
Typical Application Circuits



Typical Performance Characteristics

Delay Time vs.
Ambient Temperature

XC61FC3012
XC61HC3012



Ordering Information

XC61F①②③④⑤⑥⑦-⑧
XC61H①②③④⑤⑥⑦-⑧

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage	16~60	e.g. 2.5V→②2, ③5
④	Output Delay	1	50ms ~ 200ms
		4	80ms ~ 400ms
		5	1ms ~ 50ms
⑤	Detect Accuracy	2	± 2%
⑥⑦-⑧(*1)	Packages (Order Unit)	MR-G	SOT-23 (3,000pcs/Reel)
		PR-G	SOT-89 (1,000pcs/Reel) *XC61F only

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

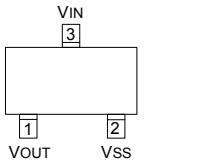
XC61C/XC61G Series

Standard Voltage Detectors

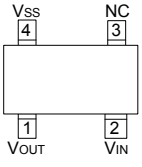
General Description

The XC61C/XC61G series are highly precise, low quiescent current voltage detectors, manufactured using CMOS and laser trimming technologies. Detect voltage is accurate with minimal temperature drift.
Both CMOS and N channel open drain output configurations are available.

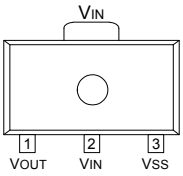
Pin Configuration



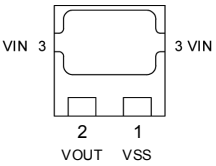
SOT-23
(TOP VIEW)



SSOT-24(SC-82)
(TOP VIEW)



SOT-89
(TOP VIEW)

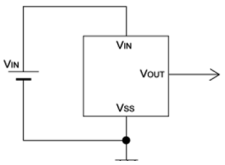


USP-3
(BOTTOM VIEW)
* XC61G only

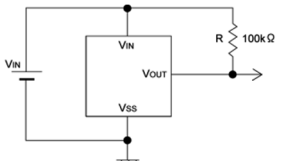
Features

Accuracy: ±2.0%
±1.0% (Standard Voltage 2.6~5.1V)
Low Quiescent Current: 0.7 μA(TYP.) [VIN=1.5V]
Detect Voltage Range: 0.8V ~ 6.0V (0.1V increments)
Operating Voltage Range: 0.7V ~ 6.0V (Low Voltage)
0.7V ~ 10.0V (Standard Voltage)
Detect Voltage Temperature Characteristics: ± 100ppm/°C(TYP.)
Output Configuration: N-channel open drain or CMOS
Operating Ambient Temperature: -40°C ~ +85°C
Packages: XC61C (SSOT-24, SOT-23, SOT-89)
XC61G (USP-3)
Environmentally Friendly: EU RoHS Compliant, Pb Free

Typical Application Circuits

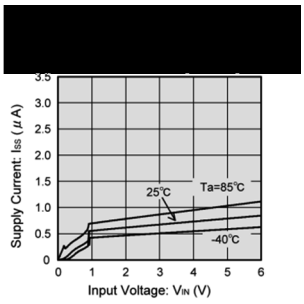


CMOS Output

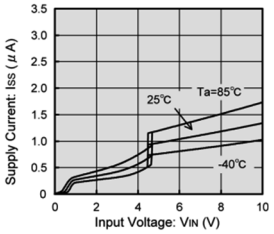


Nch Open Drain Output

Typical Performance Characteristics



Supply Current vs. Input Voltage
XC61CC4502 (4.5V)
XC61GC4502 (4.5V)



Ordering Information

XC61C①②③④⑤⑥⑦-⑧
XC61G①②③④⑤⑥⑦-⑧

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage	08~60	e.g. 0.9V→②0, ③9
			e.g. 1.5V→②1, ③5
④	Output Delay	0	No delay
⑤	Detect Accuracy	1	± 1.0% *XC61C only
		2	± 2.0%
⑥⑦-⑧(*1)	Packages (Order Unit)	NR-G	SSOT-24 (SC-82) (3,000pcs/Reel) *XC61C only
		MR-G	SOT-23 (3,000pcs/Reel) *XC61C only
		PR-G	SOT-89 (1,000pcs/Reel) *XC61C only
		HR-G	USP-3 (3,000pcs/Reel) *XC61G only

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC61J Series

Highly Accurate, Ultra Small, Low Power Consumption Voltage Detector

RoHS Compliant, Halogen & Antimony FREE

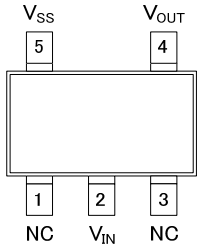
General Description

The XC61J series is highly precise, low power consumption voltage detectors, manufactured using CMOS and laser trimming technologies. With low power consumption and high accuracy, the series is suitable for precision mobile equipment.
The XC61J in ultra small package is ideally suited for high-density mounting. The XC61J is available in both CMOS and N-channel open drain output configurations.

Features

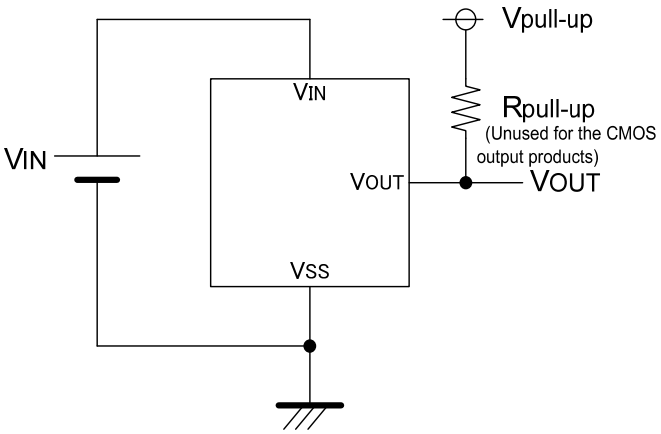
Highly Accurate: ± 2% (V_{DF}≧1.5V)
± 30mV (V_{DF}<1.5V)
Low Power Consumption: 0.6μA [V_{DF}=2.7V, V_{IN}=2.97V]
Detect Voltage Range: 1.0V ~ 5.0V (0.1V increments)
Operating Voltage Range Detect Voltage: 0.7V ~ 6.0V
Temperature Characteristics: ±100ppm/℃ (TYP.)
Output Configuration: CMOS (XC61JC)
N-channel open drain (XC61JN)
Operating Temperature Range: -40℃~+85℃
Package: SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



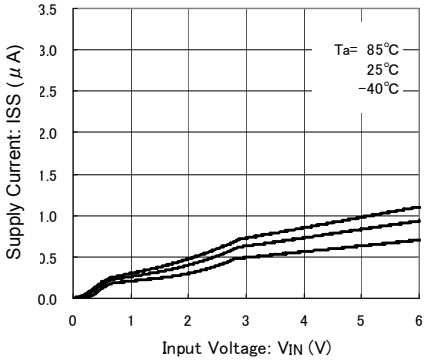
SOT-25
(TOP VIEW)

Typical Application Circuits



Typical Performance Characteristics

●Supply Current vs. Input Voltage
XC61Jx2702



Ordering Information

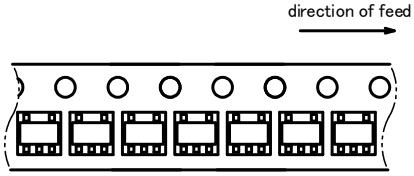
XC61J①②③④⑤⑥⑦-⑧

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	Nch open drain output
②③	Detect Voltage	10~50	e.g. 1.0V → ②=1, ③=0
④⑤	Detect Accuracy	02	±2% (1.5V≦V_{DF}≦5.0V) ±30mV (1.0V≦V_{DF}＜1.5V)
⑥⑦-⑧(*1)	Package (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel), Standard feed(*2)
		ML-G	SOT-25 (3,000pcs/Reel), Reverse feed(*2)

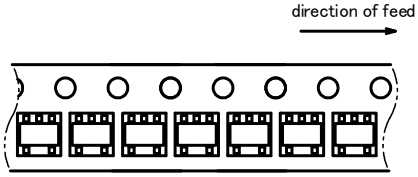
(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) SOT-25 uses Cu wires.

●Taping Specification

・MR-G



・ML-G



XC6238 Series 300mA High Speed LDO Regulator with ON/OFF Switch

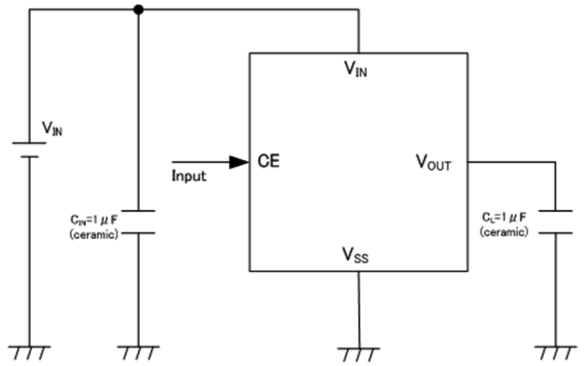
General Description

The XC6238 series is a high speed LDO regulator that features high accurate, low noise, high ripple rejection, low dropout and low power consumption. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit.
The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the series enables the electric charge at the output capacitor CL to be discharged via the internal switch, and as a result the V_{OUT} pin quickly returns to the VSS level. The output stabilization capacitor CL is also compatible with low ESR ceramic capacitors.
The output voltage is selectable in 0.05V increments within the range of 1.2V to 4.0V which fixed by laser trimming technologies. The over current protection circuit is built-in. This protection circuit will operate when the output current reaches current limit level.

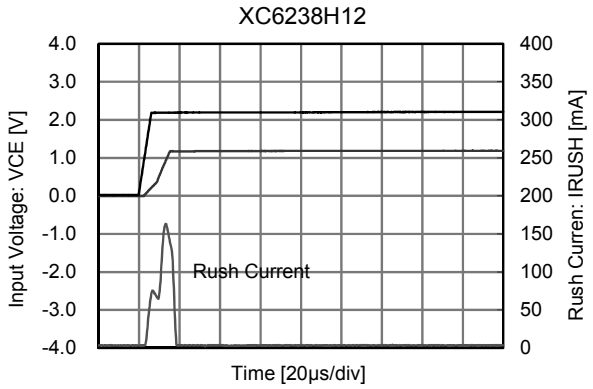
Features

Maximum Output Current: 300mA
Input Voltage Range: 1.6～5.5V
Output Voltages: 2.0～4.0V (Accuracy ±1%)
1.2～1.95V (Accuracy ±20mV)
0.05V increments
Dropout Voltage: 200mV@I_{OUT}=300mA (V_{OUT}=3.0V)
Low Power Consumption: 100μA
Stand-by Current: 0.1μA
High Ripple Rejection: 80dB@f=1kHz
Protection Circuits: Current Limit (400mA)
Short Circuit Protection
Inrush Current Protection (Type H)
Low ESR Capacitors: C_{IN}=1μF, C_L=1μF
CE Function: Active High, C_L High Speed Discharge

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6238①②③④⑤⑥-⑦ (*1)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Regulator Type	D	No Inrush Current Control
		H	Inrush Current Prevention Circuit Built-in
②③	Output Voltage	12～40	ex.) 2.80V → ②=2, ③=8, ④=please see down below.
④	Output Voltage Accuracy	1	±1% (V_{OUT}≧2.0V) ±0.02V (V_{OUT}＜2.0V) In case of 2nd decimal place 0 (ex.2.80V → ④=1)
		B	±1% (V_{OUT}≧2.0V) ±0.02V (V_{OUT}＜2.0V) In case of 2nd decimal place 5 (ex.2.85V → ④=B)
⑤⑥-⑦ (*1)	Packages (Order Unit)	6R-G	UFN-4A01 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6237 Series

Ultra-Low Quiescent Current 0.6μA High Speed LDO Voltage Regulators

RoHS Halogen Antimony FREE

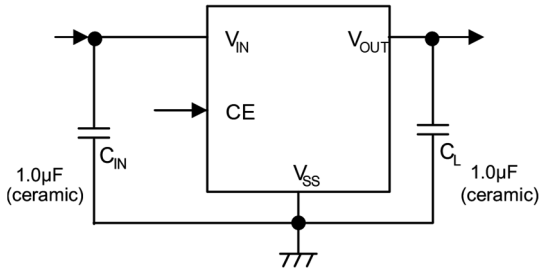
General Description

The XC6237 series are low consumption, high precise, high ripple rejection, low dropout regulators with green operation (GO) function. They are fabricated using Torex's CMOS process. Performance features of the series include a reference voltage source, an error amplifier, a current limiter, and a phase compensation circuit. Output voltage is selectable in 0.05V increments within a range of 1.2V~5.0V.
GO provides high speed operation, low consumption and high efficiencies by automatically switching between a high speed mode (HS) and a power save mode (PS) depending upon the load current level.
The CE function enables the output to be turned off resulting in greatly reduced power consumption. In this state, with the XC6237 series A Type, the IC turns on the internal switch located between the V_{OUT} and V_{SS} pins. This short enables the electric charge at the output capacitor (C_L) to be discharged via the internal auto-discharge resistance, and as a result the V_{OUT} pin quickly returns to the V_{SS} level.
The series' output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors.

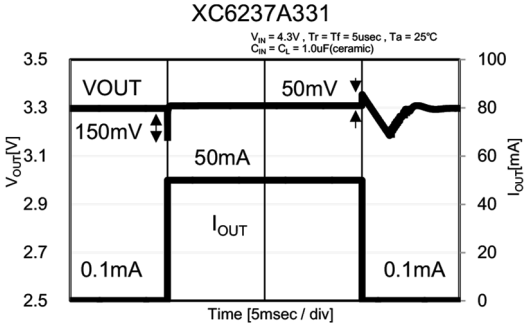
Features

Low Quiescent Current:	0.6μA TYP (PS)
Accuracy:	±0.8% (V_{OUT}≧2.50V) ±20mV (V_{OUT}≦2.45V)
Operating Voltage Range:	1.6V～6.0V (Absolute Max. Rating: 6.5V)
Output Voltage Range:	1.2V～5.0V (0.05V increments)
Max. Output Current:	150mA
Standby Current:	0.1μA
High Ripple Rejection:	60dB@1KHz
Function:	Green Operation , CE active "H" C_L High Speed Discharge (Selection)
Protective Function:	Current Limit, Short Protection
Output Capacitor:	Low ESR Ceramic
Package:	USPQ-4B05, SSOT-24 SOT-23
Environmentally Friendly:	EU RoHS Compliant, Pb Free

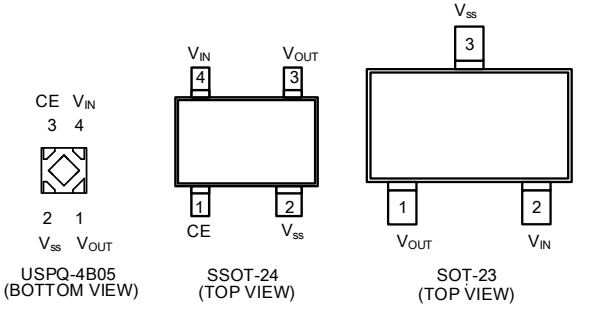
Typical Application Circuit



Typical Performance Characteristics



Pin Configuration



Absolute Maximum Ratings

PARAMETER		SYMBOL	RATINGS	UNITS
V_{IN} Pin Voltage		V_{IN}	-0.3～+6.5	V
V_{OUT} Pin Current		I_{OUT}	250(*1)	mA
V_{OUT} Pin Voltage		V_{OUT}	-0.3～V_{IN}+0.3 or 6.5 (*2)	V
CE Pin Voltage		V_{CE}	-0.3～+6.5	V
Power Dissipation	USPQ-4B05	Pd	TBD	mV
			550(when mounted on board) (*3)	
	SSOT-24		150	
			500(when mounted on board) (*3)	
	SOT-23		250	
			500(when mounted on board) (*3)	
Operating Ambient Temperature		Topr	-40～+105	℃
Storage Temperature		Tstg	-55～+125	℃

All voltages are described based on the V_{SS}.
(*1) Please use within the range of I_{OUT}≦Pd / (V_{IN}-V_{OUT})
(*2) The maximum rating corresponds to the lowest value between V_{IN}+0.3 or +6.5.
(*3) This is a reference data taken by using the test board.

Pin Assignment

PIN NUMBER			PIN NAME	FUNCTION
USPQ-4B05	SSOT-24	SOT-23		
4	4	2	V_{IN}	Power Input
2	2	3	V_{SS}	Ground
1	3	1	V_{OUT}	Output
3	1	-	CE	ON/OFF Control

Ordering Information

XC6237①②③④⑤⑥-⑦(*1)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	With CE function and C_L Auto-Discharge
		B	With CE function
		C	3 pin regulator (without CE function)
②	Output Voltage	12～50	e.g. 2.8V ②=2, ③=8
④	Output Voltage Accuracy	1	0.10V increments ±1.0% (V_{OUT}≧2.00V)、±0.02V(V_{OUT}＜2.00V) e.g. 2.80V → ④=1
		B	0.05V increments ±1.0% (V_{OUT}≧2.05V)、±0.02V(V_{OUT}＜2.05V) e.g. 2.85V → ④=B
⑤⑥-⑦ (*1)	Packages (Order Unit)	9R-G	USPQ-4B05 (TYPE A/B) (5,000/Reel)
		NR-G	SSOT-24 (TYPE A/B) (3,000/Reel)
		MR-G	SOT-23 (TYPE C) (3,000/Reel)

(*1) "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

XC6233 Series

200mA High Speed LDO Voltage Regulator with Built-in Inrush Current Protection

RoHS Halogen Antimony FREE

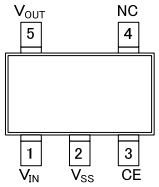
General Description

The XC6233 series is a 200mA high speed LDO regulator that features high accurate, high ripple rejection and low dropout. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit and an inrush current protection circuit.
The output voltage is selectable in 0.05V increments (±1.0%) within the range of 1.2V to 3.6V using laser trimming technologies. The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the series enables the electric charge at the output capacitor C_L to be discharged via the internal switch, and as a result the V_{OUT} pin quickly returns to the Low level.
The series is also compatible with low ESR ceramic capacitors, which provides stable output voltage. This stability can be maintained even during load fluctuations due to the excellent transient response.
The over current protection circuit is built-in. The protection circuit will operate when the output current reaches current limit level.

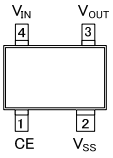
Features

Max. Output Current: 200mA
Input Voltage Range: 1.7V～5.5V
(Absolute Max. Rating : 6.0V)
Output Voltage Range: 1.2V～3.6V (±1.0%) 0.05V increments
Dropout Voltage: 240mV @I_{OUT}=200mA (V_{OUT}=3.0V)
Low Quiescent Current: 45μA (TYP.)
Stand-by Current: 0.1μA
High Ripple Rejection: 75dB@1kHz
CE Pin Function: Active High
C_L Discharge
Inrush Current Protection
Protection Circuit: Current Limit 255mA (TYP.)
Short Circuit Protection 60mA (TYP.)
External Capacitor: 1.0μF
Operating Ambient Temperature: -40℃～+85℃
Packages: USPQ-4B04
USP-4
SSOT-24
SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

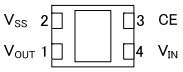
Pin Configuration



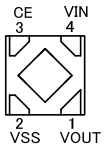
SOT-25
(TOP VIEW)



SSOT-24
(TOP VIEW)

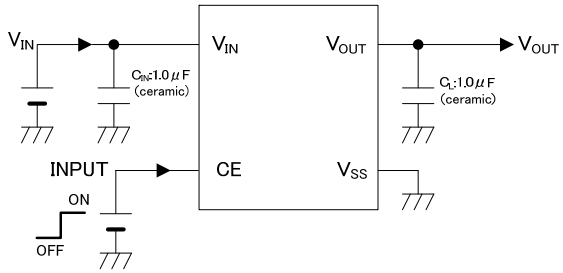


USP-4
(BOTTOM VIEW)

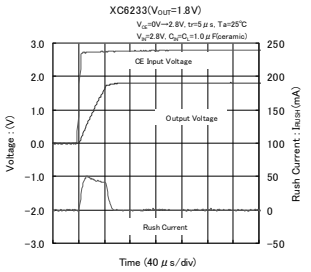


USPQ-4B04
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6233①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulator CE Active High	H	With Inrush Current Protection, With CE Pull-down, With C_L discharge
②③	Output Voltage	12～36	ex.）2.80V → ②=2, ③=8 ④= please see down below
④	Output Voltage Accuracy	1	0.10V increments ±1.0% (V_{OUT}≧2.00V), ±0.02V (V_{OUT}＜2.00V) e.g. 2.80V → ④=1
		B	0.05V increments ±1.0% (V_{OUT}≧2.05V), ±0.02V (V_{OUT}＜2.05V) e.g. 2.85V → ④=B
⑤⑥-⑦(*1)	Packages (Order Unit)	9R-G	USPQ-4B04 (3,000pcs/Reel)
		GR-G	USP-4 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
For another type of regulators, please contact your local Torex sales office or representative.

XC6231 Series

10V Input 500mA High Speed LDO Regulators

RoHS Halogen Antimony FREE

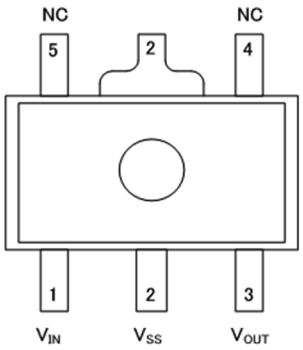
General Description

XC6231 series are highly precise, low noise, positive voltage LDO regulators which features high ripple rejection and low dropout. Output voltage is selectable within a range of 0.9V ~ 5.5V. The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series. The current limiter's foldback circuit operates as a short-circuit protection as well as the output current limiter for the output pin.

Features

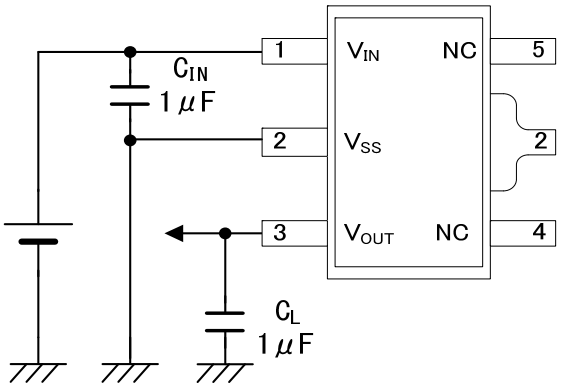
Max. Output Current: 500mA (600mA limit)
($2.5V \leqq V_{OUT} \leqq 5.5V$)
Dropout Voltage: 200mV @ 100mA
Operating Voltage Range: 2.0V～10.0V
(Absolute Max. Rating: 12.0V)
Output Voltage Range: 0.9V～5.5V (0.1V increments)
Output Voltage Accuracy: ±2%
Temperature Coefficient: ±100ppm/℃ (TYP.)
Low Power Consumption: 35μA (TYP.)
High Ripple Rejection: 65dB @ 10kHz
Protection circuits: Current Limiting
Low ESR Capacitor: Ceramic Capacitor Compatible
Operating Ambient Temperature: - 40℃ ~ + 85℃
Package: SOT-89-5
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

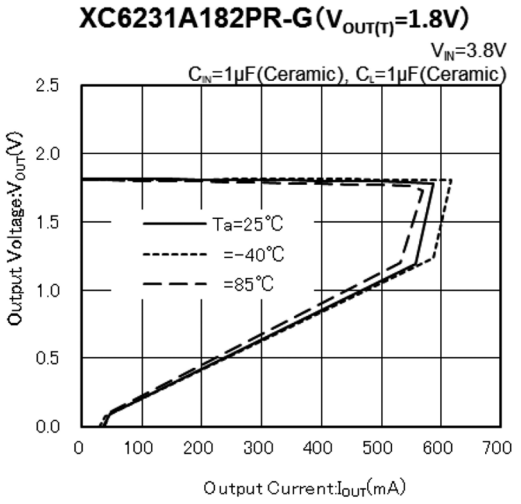


SOT-89-5
(TOP VIEW)

Typical Application Circuits



Typical Performance Characteristics



Ordering Information

XC6231A①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	09～55	0.9V～5.5V (0.1V step)
③	Output Voltage Accuracy	2	±2%
④⑤-⑥(*1)	Package (Order Unit)	PR-G	SOT-89-5 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6230 Series

Adjustable Voltage Output Multifunction 2A High Speed LDO Regulator

RoHS Halogen Antimony FREE

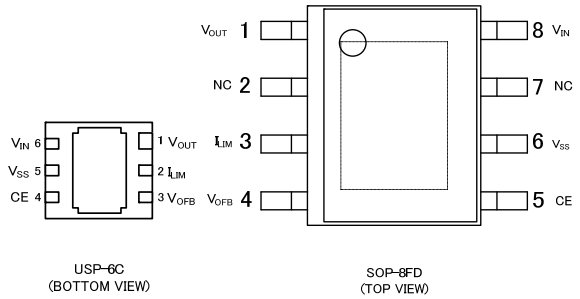
General Description

The XC6230 series are low on-resistance / low dropout voltage, highly precise, low noise, high PSRR, and large current High Speed LDO regulator IC.
Internal circuitry includes a reference voltage supply, error amplifier, driver transistor, over-current protection circuit, in-rush current prevention circuit, reverse current protection circuit, thermal shutdown circuit, and phase compensation circuit.
A built-in 0.17Ω low ON-resistance Pch driver transistor which can output up to a maximum output current 2.0A are also enclosed in a small surface-mount PKG, even in applications that input and output voltage difference is you use a very small state, it is possible to use in the space-saving.
A low ESR ceramic capacitor can be used for the output capacitor (C_L).
Then, the output voltage is possible to set the output voltage value to 1.2V ~ 5.0V by connecting the external resistors to V_{OFB} terminal.
The over current protection circuit will operate when the output current reaches its current limit. The thermal shutdown circuit will operate when the junction temperature reaches its limit temperature. The current limit is possible to arbitrarily set in a range of external resistor in 0.3 ~ 2.5A to I_{LIM} terminal. The inrush current prevention circuit perform the function of suppressing the variation of the V_{IN} line and It is possible to suppress the current (inrush current), which is charged in the output capacitor (C_L) during IC start rising (when the IC control in CE). In addition, the CE function enables the output to be turned off and the IC becomes a stand-by mode resulting in greatly reduced power consumption. When in standby mode, the output capacitor (C_L) to be discharged at high speed it can be returned to the V_{SS} level.
The IC has further built-in reverse current prevention circuit, to prevent backflow current when the voltage state of more than input terminal (V_{IN}) to the output terminal (V_{OUT}).

Features

Max. Output Current:	2A
Current Limit Setting Range:	0.3A～2.5A
Dropout Voltage:	0.17V@I_{OUT}=1.0A/$V_{OUT(T)}$=3.3V
Input Voltage Range:	1.7V～6.0V (Absolute Max. Rating: 7.0V)
V_{OFB} Accuracy:	1.2V (±1.0%)
Output Voltage Setting Range:	1.2V～5.0V
Quiescent Current:	45μA
Functions:	Reverse Current Protection (Option) Inrush Current Prevention Output Voltage Adjustable C_L High Speed Discharge Current Limit Adjustable
Protection Functions:	Thermal Shutdown (Detect: 150°C, Release: 125°C (TYP.)) Current Limit Short Protection
Output Capacitor:	Ceramic Capacitor (4.7μF)
Operating Ambient Temperature:	-40°C～+105°C
Packages:	SOP-8FD, USP-6C
Environmentally Friendly:	EU RoHS Compliant, Pb Free

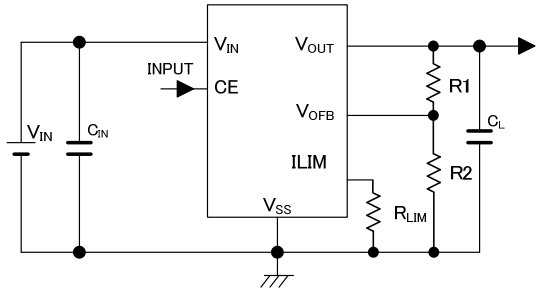
Pin Configuration



USP-6C
(BOTTOM VIEW)

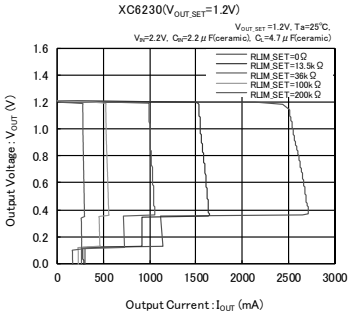
SOP-8FD
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

Output Voltage vs. Output Current (Output current externally adjusted.)



Ordering Information

XC6230①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	H	Thermal shutdown Reverse current protection Adjustable current limiter Adjustable output voltage Inrush current protection CE Pull-down resistor C_L Auto discharge
②③	Output Voltage	00	Adjustable Output Voltage (V_{OFB}=1.20V)
④	Adjustable Output Voltage Accuracy	1	±1%
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		QR-G	SOP-8FD (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6229 Series

300mA Ultra Small High Speed LDO Regulator with Built-in Inrush Current Protection

RoHS Halogen Antimony FREE

General Description

The XC6229 series is a high speed LDO regulator that features high accurate, low noise, high ripple rejection, low dropout and low power consumption. Housed in the ultra-small LGA-4B01 (0.75 x 0.75, h=0.3mm MAX.) package, the XC6229 is ideal for space-saving design. The XC6229 consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit, a thermal shutdown circuit and an inrush current protection circuit.

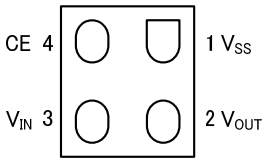
The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the series enables the electric charge at the output capacitor C_L to be discharged via the internal switch, and as a result the V_{OUT} pin quickly returns to the VSS level. The output stabilization capacitor C_L is also compatible with low ESR ceramic capacitors.

The output voltage is selectable in 0.05V increments within the range of 1.2V to 4.0V which fixed by laser trimming technologies. The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level.

Features

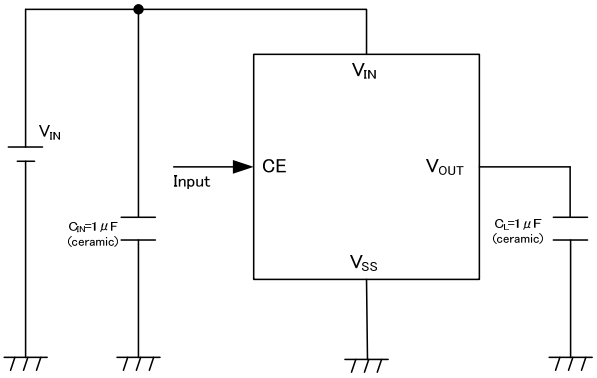
Max. Output Current: 300mA
Input Voltage Range: 1.6～5.5V
(Absolute Max. Rating: 7.0V)
Output Voltage Range: 1.2V～4.0V (0.05V increments)
Dropout Voltage: 80mV@I_{OUT}=150mA (V_{OUT}=3.0V)
Low Quiescent Current: 100μA
Accuracy: ±1% (2.0V～4.0V)
±20mV (1.2V～1.95V)
Stand-by Current: 0.1μA
High Ripple Rejection: 80dB@f=1kHz
Protection Circuits: Current Limit (400mA)
Short Circuit Protection
Over Heat Protection
Inrush Current Protection
Low ESR Capacitors: C_{IN} =1.0μF, C_L=1.0μF
CE Function : Active High
C_L High Speed Discharge
Operating Ambient Temperature: -40℃～+85℃
Package: LGA-4B01 (0.75mm×0.75mm×h 0.3MAX.)
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



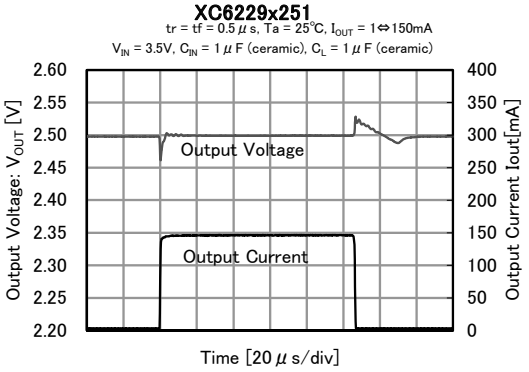
LGA-4B01
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

Load Transient Response



Ordering Information

XC6229①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulator	D	CE Active High Without Inrush Current Protection With CE Pull-down, With C_L discharge
		H	CE Active High With Inrush Current Protection With CE Pull-down, With C_L discharge
②③	Output Voltage	12～40	ex.) 2.80V → ②=2, ③=8, ④=please see down below.
④	Output Voltage (2nd decimal place)	1	±1.0%, In case of 2nd decimal place 0 (ex.2.80V → ④=1)
		B	±1.0%, In case of 2nd decimal place 5 (ex.2.85V → ④=B)
⑤⑥-⑦(*1)	Package (Order Unit)	1R-G	LGA-4B01 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6227 Series

700mA High Speed LDO Regulator with Reverse Current Protection

RoHS Halogen Antimony FREE

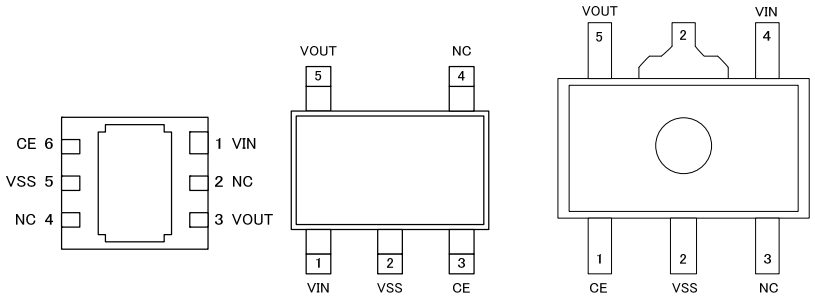
General Description

The XC6227 series is a highly accurate, low noise, high ripple rejection, low dropout, and low power consumption high speed voltage regulator.
The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a thermal protection circuit, a reverse current protection circuit and a phase compensation circuit.
The CE function enables the entire circuit to be placed in a stand-by state by inputting a low level signal to the CE pin. Over-current protection and thermal protection circuits are integrated. The protection circuit starts to operate when either output current reaches the current limit level or junction temperature reaches the temperature limit. With the reverse current protection function of a driver transistor, the reverse current flow is prohibited when V_{OUT} voltage is higher than V_{IN} voltage. For an example, when a battery is connected to the V_{OUT} pin, battery current will not flow back to the XC6227.

Features

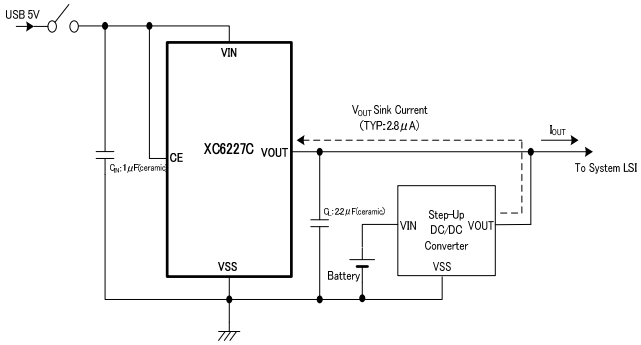
Max. Output Current:	700mA
Operating Voltage Range:	1.7V ~ 6.0V (Absolute Max. Rating: 6.5V)
Output Voltage Range:	0.8V ~ 5.0V (0.05V increments)
Dropout Voltage:	120mV@I_{OUT}=300mA (V_{OUT}=3.0V)
Low Quiescent Current:	100 μA
Accuracy:	±1.0% (V_{OUT}＞2.0V) ±0.02V (V_{OUT}≦2.0V)
High Ripple Rejection:	65dB@1kHz
ON/OFF Control:	Active High 0.1 μA (Stand-by)
Output Capacitor:	Ceramic capacitor
Operating Ambient Temperature:	-40°C ~ +85°C
Packages:	USP-6C, SOT-25, SOT-89-5
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



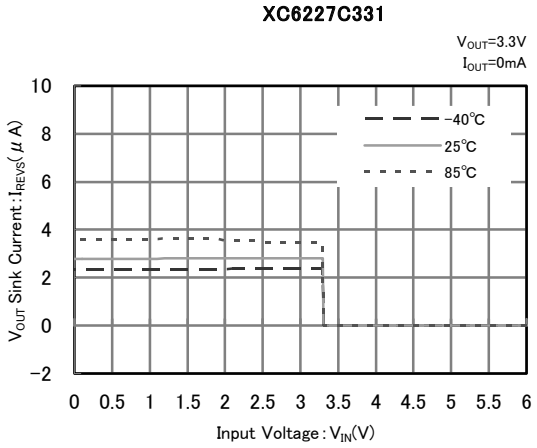
USP-6C (BOTTOM VIEW) | SOT-25 (TOP VIEW) | SOT-89-5 (TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

●V_{OUT} Sink Current VS. Input Voltage



Ordering Information

XC6227①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of CE (*2)	C	with CE Active High, with CE Pull-down resistor
②③	Output Voltage	08~50	e.g.) 2.8V → ②=2 ③=8
④	Output Voltage (the 2nd decimal place)	1	Output voltage {x.x0V} e.g. 2.80V →②=2, ③=8, ④=1
		B	Output voltage {x.x5V} e.g. 2.85V →②=2, ③=8, ④=B
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For without CE Pull-down, please contact your local Torex sales office or representative.

XC6225 Series

30mA High Speed LDO Regulator

RoHS Compliant, Halogen Antimony FREE

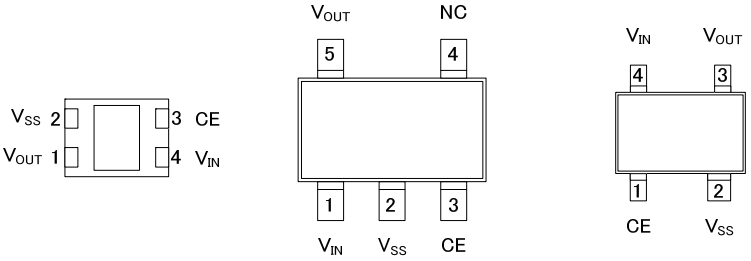
General Description

The XC6225 series is a high accuracy, low noise, and low dropout CMOS LDO regulator. The series includes a reference voltage source, an error amplifier, a driver transistor, a current limiter, and a phase compensation circuit.
The CE function enables the entire circuit to be turned off by a low level input signal to the CE pin. In this stand-by state, the XC6225B series can discharge the electric charge stored at the output capacitor through the internal auto-discharge switch, and as a result the V_{OUT} pin quickly returns to the V_{SS} level. The output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors. Output voltage is selectable in 0.05V increments within a range of 0.8V~5.0V. The current limit fold-back circuit works as a short circuit protection as well as the output current limiter. The series achieves a fast response with only 25 μA of low power consumption. The current limit is set to 50mA (TYP.) so that the device is optimized to protect the circuit from over-current. It is ideally suited for applications requiring 30 mA or less.
A small USP-4 package makes high density mounting possible.

Features

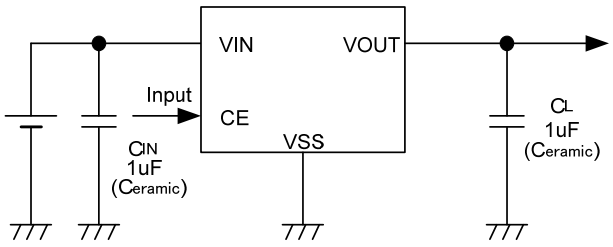
Max. Output Current:	30mA <50mA (TYP.) Limit>
Operating Voltage Range:	2.5V ~ 6.0V (Absolute Max. Rating: 6.5V)
Output Voltage Range:	0.8V~5.0V (0.05V increments)
Dropout Voltage:	70mV@ I_{OUT}=30mA, V_{OUT}=3.2V
Low Quiescent Current:	25 μA (TYP.)
Accuracy:	±2.0% ($V_{OUT} \geq 1.5V$) ±0.03V ($V_{OUT} \leqq 1.45V$)
Stand-by Current:	Less than 0.1 μA
High Ripple Rejection:	70dB @ 1kHz
Output Capacitor:	1.0 μF ceramic capacitor
CE Pin Function:	Active High
C_L High Speed Auto Discharge (XC6225B)	
Operating Ambient Temperature:	-40°C ~+85°C
Packages:	USP-4, SOT-25, SSOT-24
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration

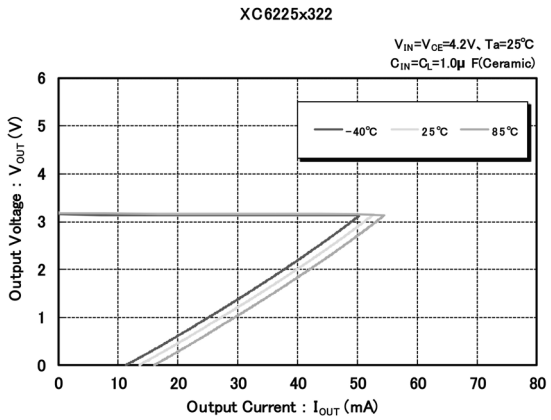


USP-4 (BOTTOM VIEW) | SOT-25 (TOP VIEW) | SSOT-24 (TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6225①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Without C_L discharge function
		B	With C_L discharge function
②③	Output Voltage	08～50	e.g. 3.0V → ①=3, ②=0
④	Output Voltage Accuracy	2	Output voltage is { x.x0V } (the 2nd decimal place is "0")
		A	Output voltage is { x.x5V } (the 2nd decimal place is "5")
⑤⑥-⑦(*1)	Packages (Order Unit)	GR-G	USP-4 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6224 Series

1.2V Low Voltage Operation, 150mA High Speed LDO Voltage Regulator

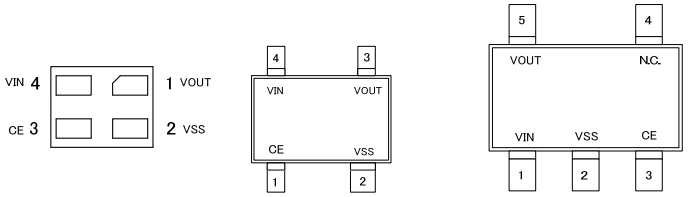
General Description

The XC6224 series is a high speed LDO regulator that features high accurate, low noise, high ripple rejection, low dropout and low power consumption. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, and a phase compensation circuit.
This IC is suitable for a local power supply placed in adjacent to the system logic LSI or others, because of low input voltage operation, using an ultra small package USPN-4B02 (0.75mm x 0.95mm) and stable operation with a small phase compensation capacitor (C_L) 0.47 μF.
Also, this IC has fast transient response and high ripple rejection (70dB @ 1kHz).
The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the series enables the electric charge at the output capacitor C_L to be discharged via the internal switch, and as a result the V_{OUT} pin quickly returns to the V_{SS} level.
The over current protection circuit is integrated and operates when the output current reaches current limit level.

Features

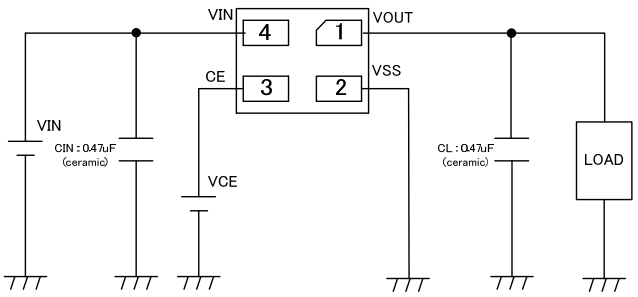
Max. Output Current: 150mA
Operating Voltage Range: 1.2V ~ 3.6V
(Absolute Max. Rating: 4.6V)
Output Voltage Range: 0.8V ~ 3.0V (0.05V increments)
Dropout Voltage: 210mV@150mA (V_{OUT}=2.8V)
Low Quiescent Current: 33 μA (TYP.)
High Accuracy: ±1.5% (Output Voltage 1.25V ~ 3.0V)
±20mV (Output Voltage 0.8V ~ 1.20V)
High Ripple Rejection: 70dB (1kHz)
Protection Circuits: Current Limiter, Short Circuit Protection
ON/OFF Control: Active High
C_L Auto Discharge Function
0.1 μA (Stand-by)
Output Capacitor: Low ESR Capacitor
Operating Ambient Temperature: -40°C ~ +85°C
Packages: USPN-4B02, SSOT-24, SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



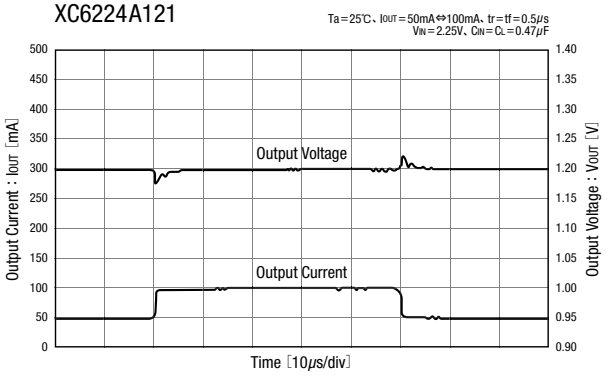
USPN-4B02 (BOTTOM VIEW) | SSOT-24 (TOP VIEW) | SOT-25 (TOP VIEW)

Typical Application Circuit



USPN-4B02 0.75mm × 0.95mm size
(BOTTOM VIEW)

Typical Performance Characteristics



Ordering Information

XC6224①②③④⑤⑥-⑦ CE Active High, with C_L Discharge, ±1% Accuracy

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulator	A (The Recommended Type)	Without CE pull-down
		B	With CE pull-down
②③	Output Voltage	08~30	e.g.) 2.5V → ②=2 ③=5
④	Output Voltage Type (The 2nd Decimal Place)	1	{x.x0V} (the 2nd decimal place is "0")
		B	{x.x5V} (the 2nd decimal place is "5")
⑤⑥-⑦(*1)	Packages (Order Unit)	7R-G	USPN-4B02 (5,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6223 Series

RoHS Halogen Antimony FREE

300mA High Speed LDO Voltage Regulator with Built-in Inrush Current Protection

General Description

The XC6223 series is a high speed LDO regulator that features high accurate, low noise, high ripple rejection, low dropout and low power consumption. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit, a thermal shutdown circuit and an inrush current protection circuit.

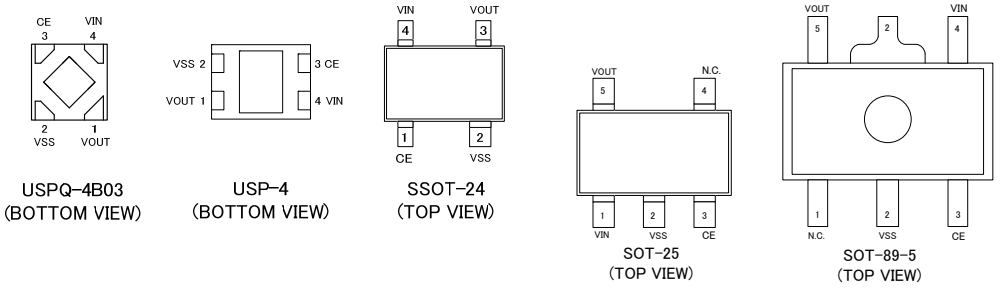
The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the series enables the electric charge at the output capacitor C_L to be discharged via the internal switch, and as a result the V_{OUT} pin quickly returns to the V_{SS} level. The output stabilization capacitor C_L is also compatible with low ESR ceramic capacitors.

The output voltage is selectable in 0.05V increments within the range of 1.2V to 4.0V which fixed by laser trimming technologies. The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level.

Features

Max. Output Current:	300mA
Output Voltage Range:	1.2V～4.0V (0.05V increments)
Dropout Voltage:	200mV@I_{OUT}=300mA (V_{OUT}=3.0V)
Low Quiescent Current:	100μA
Accuracy:	±1% (2.0V～4.0V) ±20mV (1.2V～1.95V)
Input Voltage Range:	1.6～5.5V (Absolute Max. Rating: 7.0V)
Stand-by Current:	0.1μA
High Ripple Rejection:	80dB@f=1kHz
Protection Circuits:	Current Limit (400mA) Short Circuit Protection Thermal Shutdown Inrush Current Protection
Low ESR Capacitors:	C_{IN}=1.0μF, C_L=1.0μF
CE Function:	Active High, CL High Speed Discharge
Operating Ambient Temperature:	- 40℃~ +85℃ (A/B/C/D/E/F/G/H) - 40℃~ +105℃ (J/K/M/N/P/Q/R/T)
Packages:	USPQ-4B03, SSOT-24, SOT-25, SOT-89-5, USP-4
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



USPQ-4B03 (BOTTOM VIEW)

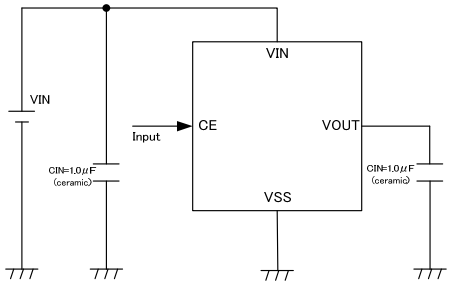
USP-4 (BOTTOM VIEW)

SSOT-24 (TOP VIEW)

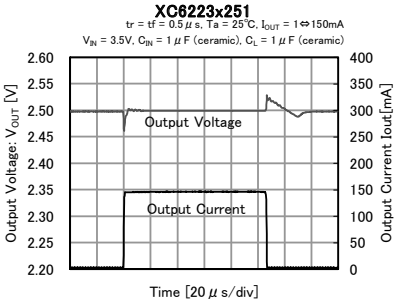
SOT-25 (TOP VIEW)

SOT-89-5 (TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6223①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION		
			Inrush Current Protection	CE Pull-Down Resistor	C_L Discharge
①	Type	A/J*	NO	NO	NO
		B/K*	NO	NO	YES
		C/M*	NO	YES (1MΩ, TYP built-in)	NO
		D/N	NO	YES (1MΩ, TYP built-in)	YES
		E/P*	YES	NO	NO
		F/Q*	YES	NO	YES
		G/R*	YES	YES (1MΩ, TYP built-in)	NO
		H/T (The Recommended Type)	YES	YES (1MΩ, TYP built-in)	YES
②③	Output Voltage	12～40	ex.) 2.80V →②=2, ③=8, ④=please see down below.		
④	Output Voltage Accuracy	1	±1% (V_{OUT}≧2.0V), ±0.02V (V_{OUT}<2.0V) In case the 2nd decimal place of output voltage is "0" → ex.) 2.80V		
		B	±1% (V_{OUT}≧2.0V), ±0.02V (V_{OUT}<2.0V) In case the 2nd decimal place of output voltage is "5" → ex.) 2.85V		
⑤⑥-⑦(*1)	Packages (Order Unit)	9R-G	USPQ-4B03 (5,000pcs/Reel)		
		NR-G	SSOT-24 (3,000pcs/Reel)		
		MR-G	SOT-25 (3,000pcs/Reel)		
		PR-G	SOT-89-5 (1,000pcs/Reel)		
		GR-G	USP-4 (3,000pcs/Reel)		

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

* semi-custom

XC6222 Series

700mA High Speed LDO Regulator

RoHS Halogen Antimony FREE

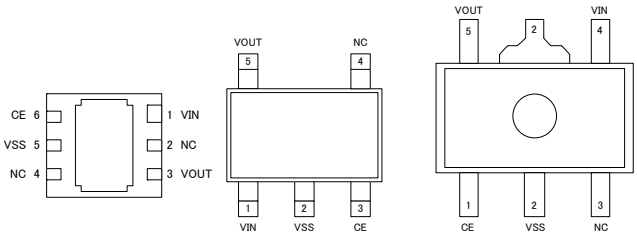
General Description

The XC6222 series is a highly accurate, low noise, high ripple rejection, low dropout, and low power consumption high speed CMOS voltage regulator. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a thermal protection circuit, and a phase compensation circuit.
The CE function enables the entire circuit to be placed in a stand-by state by inputting a low level signal to the CE pin. In this stand-by mode, the electric charge at the output capacitor (CL) will be discharged by the internal auto-discharge switch, and as a result the VOUT pin will quickly return to the VSS level.
Over-current protection and thermal protection circuits are integrated. The protection circuit starts to operate when either output current reaches the current limit level or junction temperature reaches the temperature limit.

Features

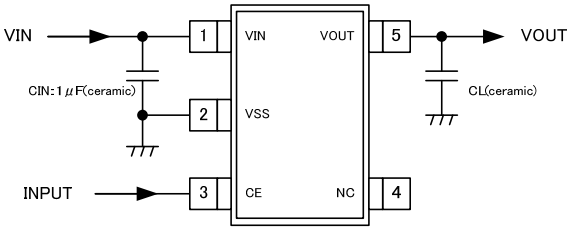
Max. Output Current: 700mA
Operating Voltage Range: 1.7V ~ 6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Range: 0.8V~5.0V (0.05V increments)
Dropout Voltage: 120mV @I_{OUT}=300mA(V_{OUT}=3.0V)
Low Quiescent Current: 100μA (V_{OUT}=3.0V)
Accuracy: ±1.0% (V_{OUT}＞2.0V)
±0.02V (V_{OUT}≦2.0V)
Stand-by Current: Less than 0.1μA (CE Active High)
High Ripple Rejection: 65dB @ 1kHz
CE Pin Function: Active High
Low ESR Capacitor: Ceramic capacitor
Operating Ambient Temperature: -40℃~+85℃
Packages: USP-6C, SOT-25, SOT-89-5
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

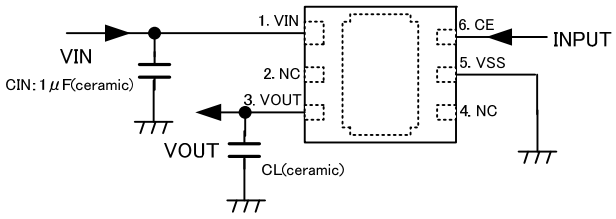


USP-6C (BOTTOM VIEW) SOT-25 (TOP VIEW) SOT-89-5 (TOP VIEW)

Typical Application Circuits



SOT-25 (TOP VIEW)

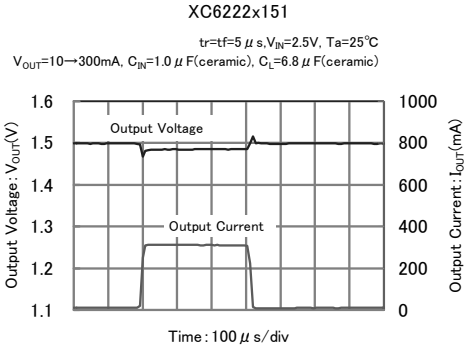


USP-6C (TOP VIEW)

*C_L: 2.2μF or higher (V_{OUT}=2.5～5.0V)
4.7μF or higher (V_{OUT}=2.1～2.45V)
6.8μF or higher (V_{OUT}=0.8～2.05V)

Typical Performance Characteristics

● Load Transient Response



Ordering Information

XC6222①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	without CE Pull-down resistor, without C_L discharge (semi-custom)
		B	without CE Pull-down resistor , with C_L discharge (semi-custom)
		C	with CE Pull-down resistor, without C_L discharge (semi-custom)
		D	with CE Pull-down resistor, with C_L discharge (standard)
②③	Output Voltage	08～50	e.g. 2.8V → ②=2, ③=8 Output Voltage Range : 0.8～5.0 V (0.05V increments)
④	Output Voltage Type (The 2nd Decimal Place)	1	Output voltage {x.x0v} (the 2nd decimal place is "0") ±1.0% (V_{OUT}＞2.0V), ±0.02V(V_{OUT}≦2.0V)
		B	Output voltage {x.x5v} (the 2nd decimal place is "5") ±1.0% (V_{OUT}＞2.0V), ±0.02V(V_{OUT}≦2.0V)
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6221 Series

200mA High Speed LDO Voltage Regulators with ON/OFF Control

RoHS Compliant, Halogen Antimony FREE

General Description

The XC6221 series are precise, low noise, high speed, low dropout regulators. They are fabricated using Torex's CMOS process. Performance features of the series include high ripple rejection and low dropout voltage, and the series include a reference voltage source, an error amplifier, a current limiter, and a phase compensation circuit.

The CE function enables the circuit to be in stand-by mode by inputing L level signal. In the stand-by mode, the series enables the electric charge at the output capacitor (C_L) to be discharged via the internal auto-discharge resistance, and as a result the V_{OUT} pin quickly returns to the V_{SS} level. The series' output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors. Output voltage is selectable in 0.05V increments within a range of 0.8V~5.0V, using laser trimming technologies.

The current limiter's foldback circuit also operates as a short circuit protection for the output current limiter and the output pin. The series achieves a great response with only 25μA of low power consumption. Also the series has low dropout voltage characteristics, which is 80mA at I_{OUT}=100mA and V_{OUT}=3.0V.

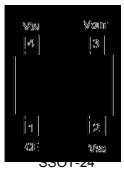
With the use of ultra small package, USPN-4 package, a small footprint circuit can be designed.

Features

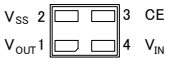
Output Current: 200mA <Up to 250mA (TYP.)>
Operating Voltage Range: 1.6V ~ 6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Range: 0.8V~5.0V (0.05V increments)
Dropout Voltage: 80mV@ I_{OUT}=100mA, V_{OUT}=3.0V
Low Quiescent Current: 25μA (TYP.)
Accuracy: ±2.0% (V_{OUT}≧1.50V) (Standard)
±30mV (V_{OUT}≦1.45V) (Standard)
±1.0% (V_{OUT}≧2.00V) (High Accuracy)
±20mV (V_{OUT}≦1.95V) (High Accuracy)
Stand-by Current: Less than 0.1μA (CE Active High)
High Ripple Rejection: 70dB @ 1kHz
CMOS
CL High Speed Auto Discharge (XC6221B/D)
Low Output Noise
Low ESR Capacitor: 1.0μF ceramic capacitor compatible
Operating Ambient Temperature: -40℃~+85℃
Packages: USP-4, SOT-25, SSOT-24, USPN-4
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

SOT-25
(TOP VIEW)

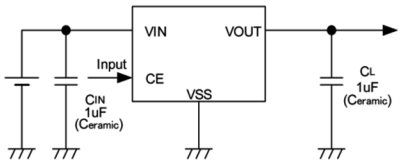


SSOT-24
(TOP VIEW)



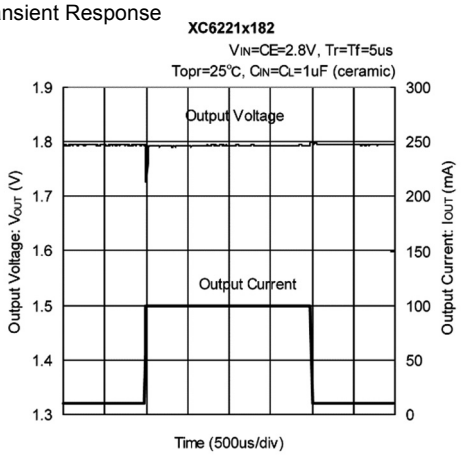
USPN-4
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Load Transient Response



Ordering Information

XC6221①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	No CE pull-down resistor without C_L auto discharge
		B	No CE pull-down resistor with C_L auto discharge
		C	CE pull-down resistor without C_L auto discharge
		D	CE pull-down resistor with C_L auto discharge
②③	Output Voltage	08 ~ 50	ex.) V_{OUT} = 3.00V →② = 3, ③ = 0
④	Output Voltage Accuracy	2	±30mV @ 0.80V≦V_{OUT}≦1.40V When 0.1V steps such as V_{OUT}=0.80V →②=0, ③=8, ④=2
			±2.0% @ V_{OUT}≧1.50V When 0.1V steps such as V_{OUT}=1.50V →②=1, ③=5, ④=2
		A	±30mV @ 0.85V≦V_{OUT}≦1.45V When 0.05V steps such as V_{OUT}=0.85V →②=0, ③=8, ④=A
			±2.0% @ V_{OUT}≧1.55V When 0.05V steps such as V_{OUT}=1.55V →②=1, ③=5, ④=A
		1	±20mV @ 0.80V≦V_{OUT}≦1.90V When 0.1V steps such as V_{OUT}=0.80V →②=0, ③=8, ④=1
			±1.0% @ V_{OUT}≧2.00V When 0.1V steps such as V_{OUT}=2.00V →②=2, ③=0, ④=1
		B	±20mV @ 0.85V≦V_{OUT}≦1.95V When 0.05V steps such as V_{OUT}=0.85V →②=0, ③=8, ④=B
			±1.0% @ V_{OUT}≧2.00V When 0.05V steps such as V_{OUT}=2.05V →②=2, ③=0, ④=B
⑤⑥-⑦(*1)	Packages (Order Unit)	GR-G	USP-4 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		7R-G	USPN-4 (5,000pcs/Reel)

* For the USPN-4 package, 0.80V≦V_{OUT}≦1.15V is under development.

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6220 Series

1A High Speed LDO Voltage Regulator with "GreenOperation"

RoHS Halogen Antimony FREE

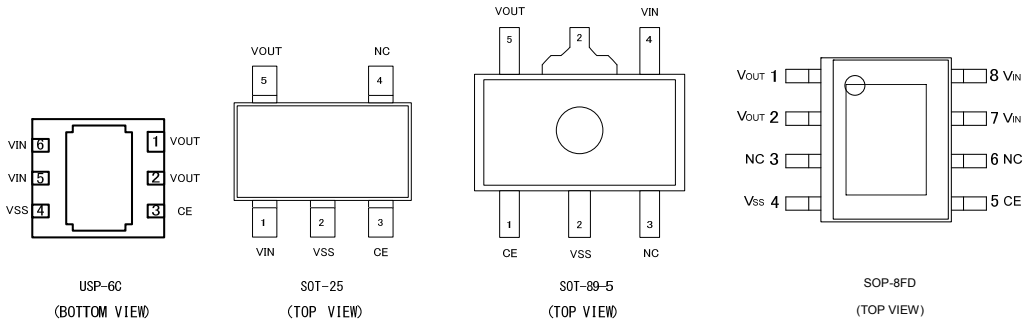
General Description

The XC6220 series is a highly accurate, low noise, high speed, low dropout, and large current CMOS voltage regulator with GreenOperation function. The series consists of a voltage reference, an error amplifier, a current limiter, an inrush current prevention circuit and a phase compensation circuit plus a driver transistor.
With a 0.2Ω on-resistance driver transistor integrated and with output currents up to 1A, the ultra low dropout voltage performance greatly extends battery life as does the GreenOperation function which can switch between high speed and power save modes automatically. Low ESR ceramic capacitors can be used for the output stabilization capacitor (C_L).
Output voltage is selectable in 0.05V increments within the range of 0.8V~5.0V, using laser trimming technologies.
An over current protection circuit and a thermal shutdown circuit are built in. The over current protection circuit will operate when the output current reaches its limit current. The thermal shutdown circuit will operate when the junction temperature reaches its limit temperature. The inrush protection circuit works by controlling the inrush current which is charged to C_L when the IC starts up. In this way, any fluctuations to V_{IN} caused by inrush current during system start up can be minimized.
The CE function enables the output to be turned off and the IC becomes a stand-by mode resulting in greatly reduced power consumption.

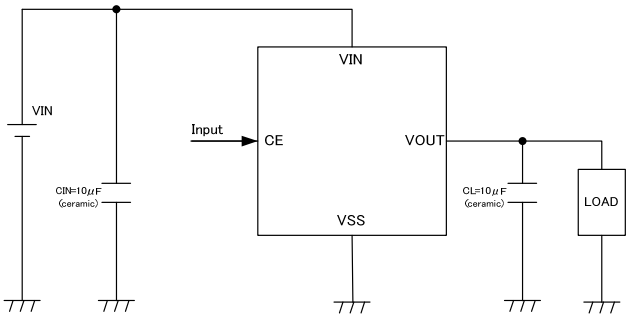
Features

Max. Output Current: 1000mA (1.2V≦V_{OUT}≦5.0V)
Operating Voltage Range: 1.6V ~ 6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Range: 0.8V ~ 5.0V (0.05V increments)
Dropout Voltage: 20mV @ 100mA (V_{OUT}=3.0V)
60mV@ 300mA (V_{OUT}=3.0V)
Low Quiescent Current: 8μA (TYP.) in PS mode
50μA (TYP.) in HS mode
Accuracy: ±1.0% (V_{OUT}≧2.0V)
±20mV (V_{OUT}＜2.0V)
Thermal Shutdown: Detect 150℃, Release 135℃(TYP.)
Inrush Current Protection: 700mA (MAX.)
C_L Auto Discharge: XC6220B/D Series
CE Pull-down Resistor: XC6220C/D Series
Output Capacitor: Ceramic Capacitor Compatible
Operating Ambient Temperature: - 40℃~ +85℃
Packages: USP-6C, SOT-25, SOT-89-5, SOP-8FD
Environmentally Friendly: EU RoHS Compliant, Pb Free

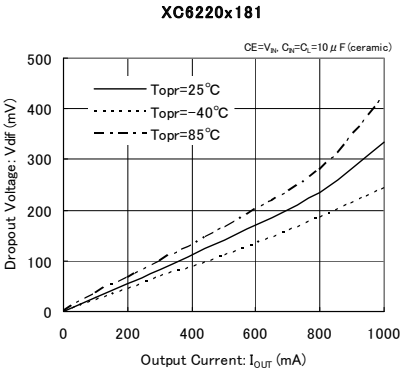
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6220①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	without CE Pull-down resistor, without C_L discharge (Semi-custom)
		B	without CE Pull-down resistor, with C_L discharge (Standard)
		C	with CE Pull-down resistor, without C_L discharge (Semi-custom)
		D	with CE Pull-down resistor, with C_L discharge (Semi-custom)
②③	Output Voltage	08~50	e.g. 3.0V → ①=3, ②=0
④	Output Voltage Type (The 2nd Decimal Place)	1	Output voltage {O.O0v} (the 2nd decimal place is "0")
		B	Output voltage {O.O5v} (the 2nd decimal place is "5")
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)
		QR-G	SOP-8FD(1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6219 Series

300mA High Speed LDO Regulator with ON/OFF Control

RoHS Halogen Antimony FREE

General Description

The XC6219 series are highly accurate, low noise, CMOS LDO voltage regulators. Offering low output noise, high ripple rejection ratio, low dropout and very fast turn-on times, error amplifiers, driver transistors, current limiters and phase compensation circuit internally. The XC6219's current limiters' foldback circuit also operates as a short protect for the output current limiter and the output pin.

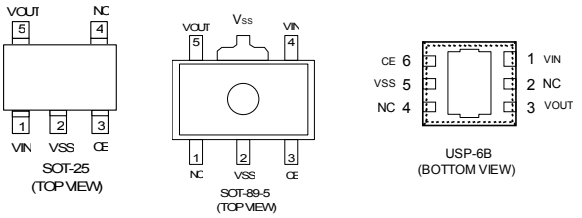
The output voltage is set by laser trimming. Voltages are selectable in 0.05V steps within a range of 0.9V to 5.0V. The XC6219 series are also fully compatible with low ESR ceramic capacitors, reducing cost and improving output stability. This high level of output stability is maintained even during frequent load fluctuations, due to the excellent transient response performance and high PSRR achieved across a broad range of frequencies.

The CE function allows the output of regulator to be turned off, resulting in greatly reduced power consumption.

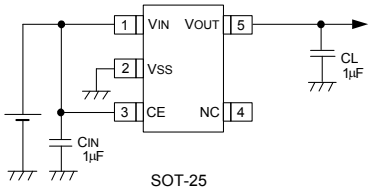
Features

Max. Output Current: 150mA (V_{OUT}<1.75V, types A~D)
240mA(V_{OUT}≥1.8V, types A~D)
300mA(V_{OUT}≧1.3V, types E~H)
Operating Voltage Range: 2.0V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Output Voltage Range: 0.9V ~ 5.0V (0.05V increments)
Dropout Voltage: 200mV (I_{OUT}=100mA)
Low Quiescent Current: 25μA (TYP.)
Accuracy: ±2.0% (V_{OUT}>1.5V)
±30mV (V_{OUT}≤1.5V)
±1.0% (V_{OUT}≦3.0V)
Stand-by Current: Less than 0.1μA (TYP.)
High Ripple Rejection: 65dB (10kHz)
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C~+85°C
Packages: SOT-25, USP-6B, SOT-89-5
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



Typical Application Circuit

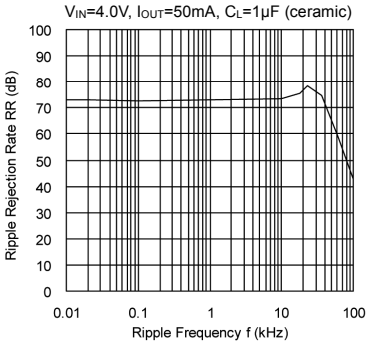


Typical Performance Characteristics

●Ripple Rejection Rate

XC6219x302

V_{IN}=4.0V, I_{OUT}=50mA, C_L=1μF (ceramic)



Ordering Information

XC6219①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	CE Pin Logic	A	150mA, Active High, pull-down resistor built in (Semi-custom)
		B	150mA, Active High, no pull-down resistor built in (Standard)
		C	150mA, Active Low, pull-up resistor built in (Semi-custom)
		D	150mA, Active Low, no pull-up resistor built in (Semi-custom)
		E	300mA, Active High, pull-down resistor built in (Semi-custom)
		F	300mA, Active High, no pull-down resistor built in (Standard)
		G	300mA, Active Low, pull-up resistor built in (Semi-custom)
		H	300mA, Active Low, no pull-up resistor built in (Semi-custom)
②③	Output Voltage	09～50	e.g. ②=3, ③=0, → 3.0V
④	Output Voltage Accuracy	2 (*3)	0.1V increments, ±2.0% accuracy e.g. ③=2, ③=8, ④=2 → 2.80V, ±2%
		1 (*2)	0.1V increments, ±1.0% accuracy e.g. ②=3, ③=0, ④=1 → 3.00V, ±1%
		A (*3)	0.05V increments, ±2.0% accuracy e.g. ②=2, ③=8, ④=A → 2.85V, ±2%
		B (*2)	0.05V increments, ±1.0% accuracy e.g. ②=3, ③=0, ④=B → 3.05V, ±1%
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000/Reel)
		PR-G	SOT-89-5 (for XC6219 only) (1,000pcs/Reel)
		DR-G	USP-6B (for XC6219 only) (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) Output voltage of the ±1% accuracy product is 3.0V or more.
(*3) Output voltage accuracy of the V_{OUT}≦1.5V is ±30mV.

XC6218 Series

200mA Low Power Consumption LDO Regulators

RoHS Halogen Antimony FREE

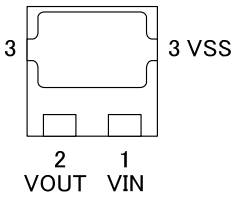
General Description

XC6218 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves very low quiescent current, 1.0μA (TYP.) and consists of a reference voltage source, an error amplifier, current limit circuit, and a phase compensation circuit plus a driver transistor.
Small USP-3 and SSOT-24 packages make high density mounting possible. Therefore, the series is ideal for applications where high density mounting is required such as in mobile phones.
Output voltage is selectable in 0.1V increments within a range of 0.9V～4.0V by laser trimming. The series is also compatible with low ESR ceramic capacitors (C_L), which give added output stability.
The current limiter's fold-back circuit also operates as a short protect for the output current limiter and the output pin.

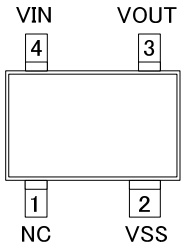
Features

Max. Output Current: 200mA (300mA Limit: TYP.)
(@V_{OUT}=3.0V, V_{IN}=4.0V)
Operating Voltage Range: 1.5V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Output Voltage: 0.9 ~ 4.0V (0.1V increments)
Dropout Voltage: 200mV@I_{OUT}=100mA
(@V_{OUT}=3.0V)
Low Quiescent Current: 1.0μA (TYP.)
Accuracy: ±2.0%
(1.5＜V_{OUT}≦4.0V)
±30mV
(0.9≦V_{OUT}≦1.5V)
External Capacitor: 0.1μF~1.0μF
Current Limit Circuit Built-in
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40℃～85℃
Packages: USP-3, SSOT-24
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

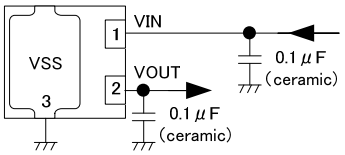


USP-3
(BOTTOM VIEW)



SSOT-24
(TOP VIEW)

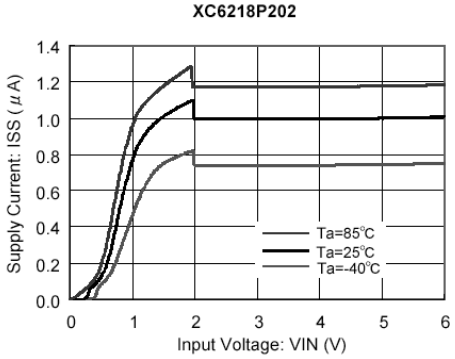
Typical Application Circuit



USP-3
(BOTTOM VIEW)

Typical Performance Characteristics

●Supply Current vs. Input Voltage



Ordering Information

XC6218P①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	09~40	Output voltage "②" represents value after the decimal point. Ex.) 15 ⇒ ①:1, ②: 5 = 1.5V 33 ⇒ ①:3, ②: 3 = 3.3V
③	Output Voltage Accuracy	2	±2.0%
④⑤-⑥(*1)	Packages (Order Unit)	HR-G	USP-3 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6217 Series

200mA High Speed "Green Operation" LDO Voltage Regulators

RoHS Compliant, Halogen & Antimony FREE

General Description

The XC6217 series are precise, low noise, high speed, low dropout regulators with green operation (GO) function. They are fabricated using Torex's CMOS process. Performance features of the series include high ripple rejection and low dropout voltage, and the series include a reference voltage source, an error amplifier, a current limiter, and a phase compensation circuit.

GO provides high speed operation, low quiescent current and high efficiencies by automatically switching between a high speed mode (HS) and a power save mode (PS) depending upon the load current level. The switching point of the GO to the output current is being fixed inside the IC. When only high-speed operation is required, it can be fixed by inputting a high level signal to the GO pin, thus providing operating conditions with the most suitable level of supply current for the application.

The CE function enables the output to be turned off resulting in greatly reduced quiescent current. In this state, with the XC6217B/D series, the IC turns on the internal switch located between the V_{OUT} and V_{SS} pins. This short enables the electric charge at the output capacitor (C_L) to be discharged via the internal auto-discharge resistance, and as a result the V_{OUT} pin quickly returns to the V_{SS} level. The series' output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors.

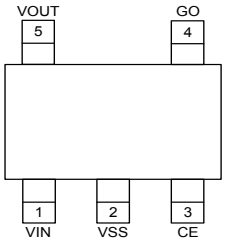
Output voltage is selectable in 0.05V increments within a range of 0.8V~4.0V, using laser trimming technologies.

The current limiter's foldback circuit also operates as a short circuit protection for the output current limiter and the output pin.

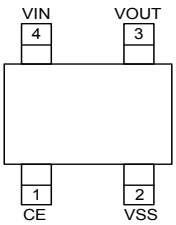
Features

Output Current: 200mA <Up to 250mA (TYP.)>
Operating Voltage Range: 1.6V ~ 6.0V (V_{OUT} : 0.8V ~ 1.55V)
1.8V ~ 6.0V (V_{OUT} : 1.6V ~ 4.0V)
Output Voltage Setting Range: 0.8V~4.0V (0.05V increments)
Dropout Voltage: 80mV@ I_{OUT}=100mA, V_{OUT}=3.0V
Low Quiescent Current: 4.5μA (TYP.) when PS mode
25μA (TYP.) when HS mode
Accuracy: ±2.0% (HS : V_{OUT}≧2.0V)
±30mV (HS : V_{OUT}≦1.95V)
+2.5%, -3.5% (PS : V_{OUT}≧2.6V)
+3.5%, -4.5% (PS : 1.6V≦V_{OUT}≦2.55V)
+70mV, -90mV (PS : 0.8≦V_{OUT}≦1.55V)
Standby Current: Less than 0.1μA
High Ripple Rejection: 70dB @ 1kHz (When HS mode)
Low ESR Capacitor: 1.0μF Ceramic capacitor compatible
Operating Ambient Temperature: -40℃~+85℃
Packages: USP-4D, SOT-25 (XC6217A/B)
SSOT-24, USPN-4 (XC6217C/D)
Environmentally Friendly: EU RoHS Compliant, Pb Free

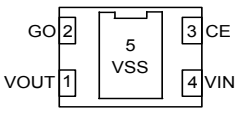
Pin Configuration



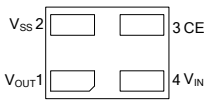
SOT-25
(TOP VIEW)



SSOT-24
(TOP VIEW)

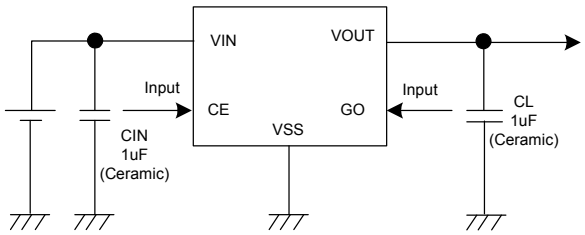


USP-4D
(BOTTOM VIEW)

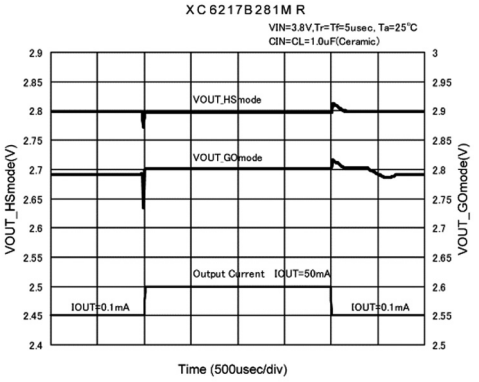


USPN-4
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6217①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulator	A	CE Active High, no C_L discharge resistor
		B	CE Active High, with C_L discharge resistor
		C	CE Active High, no C_L discharge resistor, no GO pin (SSOT-24)
		D	CE Active High, with C_L discharge resistor, no GO pin (SSOT-24)
②③	Output Voltage	08 ~ 40	ex.) $V_{OUT(T)}$ = 3.0V → ② = 3, ③ = 0
④	Output Voltage Accuracy	2	±2.0%, 0.1V increments ex.) 2.8V → ② = 2, ③ = 8, ④ = 2
		A	±2.0%, 0.05V increments ex.) 2.85V → ② = 2, ③ = 8, ④ = A
		1	±1.0%, 0.1V increments ex.) 2.8V → ② = 2, ③ = 8, ④ = 1
		B	±1.0%, 0.05V increments ex.) 2.85V → ② = 2, ③ = 8, ④ = B
⑤⑥-⑦(*1)	Packages (Order Unit)	GR-G	USP-4D (XC6217A/B type) (3,000pcs/Reel)
		MR-G	SOT-25 (XC6217A/B type) (3,000pcs/Reel)
		NR-G	SSOT-24 (XC6217C/D type) (3,000pcs/Reel)
		7R-G	USPN-4 (XC6217C/D type)(*2) (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) Output Range of USPN-4 is 1.6V≦V_{OUT}≦4.00V

XC6216 Series

28V Input Voltage Regulators with CE Pin

RoHS Halogen Antimony FREE

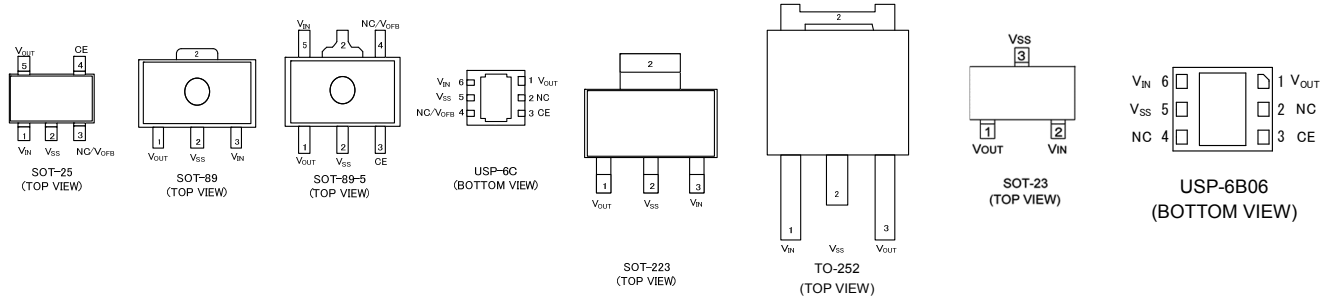
General Description

XC6216 series are highly precise, low noise, positive regulator ICs. The series consists of a voltage reference, an error amplifier, a current limiter, a thermal shutdown circuit and a phase compensation circuit plus a driver transistor.
The output voltage is selectable in 0.1V increments within the range of 1.8V to 12V using laser trimming technologies (XC6216B series). Furthermore, with external resistors, the output voltage can be set from 2.0V to 23V (XC6216C series). The series' output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors.
The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level.
The CE function enables the output to be turned off and the IC becomes a stand-by mode resulting in greatly reduced quiescent current.

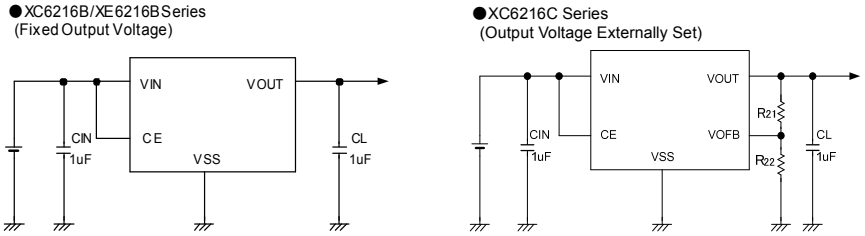
Features

Max. Output Current: 150mA (Up to 200mA)(V_{IN}=V_{OUT}+3.0V)
Input Voltage Range: 2.0V~28.0V (Absolute Max. Rating: 30.0V)
Output Voltage: 1.8V~12.0V (0.1V increments)
Setting Range: (With external resistors: 2.0V~23.0V)
Dropout Voltage: 300mV@I_{OUT}=20mA
Low Quiescent Current: 5μA
Accuracy: ±2.0% (±1.0% Possible)
Stand-by Current: Less than 0.1μA
High Ripple Rejection: 40dB@1kHz
Operating Ambient Temperature: -40℃~+85℃
Packages: SOT-25, SOT-89, SOT-89-5, USP-6C, SOT-223, TO-252,SOT-23, USP-6B06
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



Typical Application Circuits



Ordering Information

XC6216①②③④⑤⑥-⑦: CE function (Active High) Fixed output voltage 1.8V~12.0V (0.1V increments)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type and Options of Regulators	B	Fixed output voltage
		C	Output voltage externally set (V_{OFB}=2.0V)(*3)
②③	Output Voltage	18 ~ C0	For the voltage within 1.8V ~9.9V (0.1V increments); e.g. 2.5V ⇒ 25, 5.0V ⇒ 50 For the voltage within 10.0V~12.0V (0.1V increments); e.g. 10.6V ⇒ A6, 11.2V ⇒ B2, 12.0V ⇒ C0
		20	For C type (output voltage externally set), V_{OFB}=2.0V only
④	Output Voltage Accuracy (*2)	2	±2.0%
		1	±1.0%(*3)
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)
		8R-G	USP-6B06 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For the C type, the accuracy is based on V_{OFB} voltage. The actual output voltage accuracy is depended on the external resistances.
(*3) USP-6B06 package is available for the A/B types and Output Voltage Accuracy ±2%.

XC6216D①②③④⑤-⑥: 3 pin regulator (No CE function), Fixed output voltage 1.8V~12.0V (0.1V increments)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	18 ~ C0	For the voltage within 1.8V~9.9V (0.1V increments); e.g. 2.5V ⇒ 25, 5.0V ⇒ 50 For the voltage within10.0V~12.0V (0.1V increments); e.g. 10.6V ⇒ A6, 11.2V ⇒ B2, 12.0V ⇒ C0
③	Output Voltage Accuracy	2	±2.0%
		1	±1.0%
④⑤-⑥(*1)	Packages (Order Unit)	MR-G	SOT-23 (3,000pcs/Reel)
		PR-G	SOT-89 (1,000pcs/Reel)
		FR-G	SOT-223 (1,000pcs/Reel)
		JR-G	TO-252 (2,500pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6215 Series

0.8μA Low Quiescent Current Voltage Regulator with CE Pin

RoHS Compliant, Halogen Antimony FREE

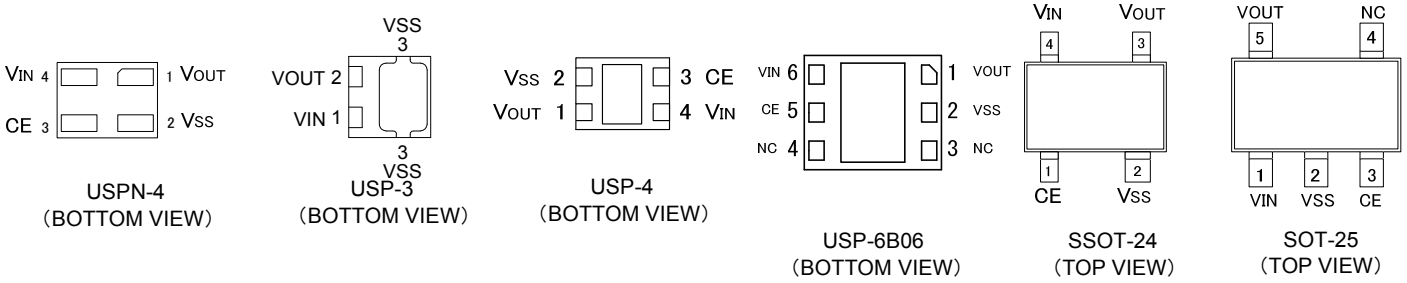
General Description

The XC6215 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves very low quiescent current, 0.8μA (TYP.) and consists of a reference voltage source, an error amplifier, a current foldback circuit, and a phase compensation circuit plus a driver transistor.
Ultra small packages USPN-4, USP-3, USP-4, USP-6B06 and SSOT-24, and small package SOT-25 packages make high density mounting possible. Therefore, the series is ideal for applications where high density mounting is required such as in mobile phones.
Output voltage is selectable in 0.1V increments within a range of 0.9V ~ 5.0V by laser trimming
The series is also compatible with low ESR ceramic capacitors, which give added output stability.
The current limiter's foldback circuit also operates as a short protect for the output current limiter and the output pin.
Furthermore, the CE function allows the output of the regulator to be turned off, resulting in greatly reduced quiescent current.

Features

Max. Output Current:	200mA (300mA Limit, TYP.) @VOUT=3.0V, VIN=4.0V
Operating Input Voltage Range:	1.5V ~ 6.0V (Absolute Max. Rating: 7.0V)
Output Voltage range:	0.9V~5.0V(0.1V Increments)
Dropout Voltage:	320mV@IOUT=100mA (@VOUT=3.0V)
Low Quiescent Current:	0.8μA(TYP.)
Accuracy:	±2.0% (1.5V<VOUT≦5.0V) ±30mV (0.9V≦VOUT≦1.5V)
Stand-by Current:	Less than 0.1μA
Output Capacitor:	Low ESR Ceramic
Operating Ambient Temperature:	- 40℃ ~ + 85℃
Packages:	USP-4, SSOT-24, USP-3(For XC6215P type only) SOT-25, USPN-4, USP-6B06
Environmentally Friendly:	EU RoHS Compliant, Pb Free

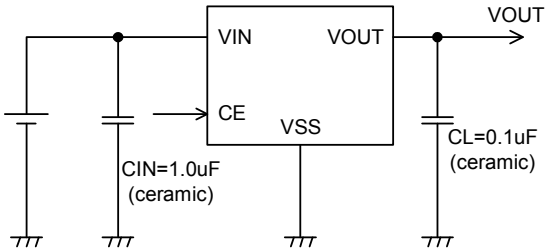
Pin Configuration



USPN-4 (BOTTOM VIEW) | USP-3 (BOTTOM VIEW) | USP-4 (BOTTOM VIEW) | USP-6B06 (BOTTOM VIEW) | SSOT-24 (TOP VIEW) | SOT-25 (TOP VIEW)

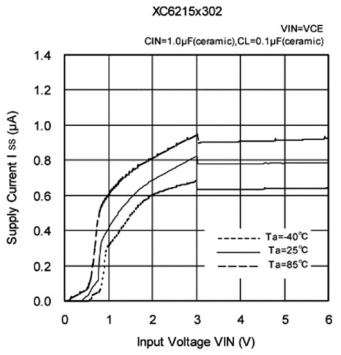
Typical Application Circuit

●USP-4 and SSOT-24 packages
(For the USP-3 package, with no CE pin)



Typical Performance Characteristics

Supply Current vs. Input Voltage



Ordering Information

XC6215①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulator	B	CE logic= Active High with pull-down registor
		P	3 pin regulator with no CE pin(USP-3 only)
②③	Output Voltage	09~50	0.9V~5.0V, 0.1V step e.g. VOUT=3.0V→②3, ③→0
④	Output Voltage Accuracy	2	±2.0%
⑤⑥-⑦(*1)	Packages (Order Unit)	GR-G	USP-4 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		HR-G	USP-3(for XC6215P type only) (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		7R-G	USPN-4 (5,000pcs/Reel)
		8R-G	USP-6B06 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6214 Series

500mA High Speed LDO Regulators, Thermal Shutdown

RoHS Halogen Antimony FREE

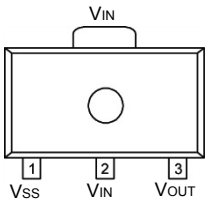
General Description

The XC6214 series are highly precise, low noise, high current, positive voltage low dropout regulators. They are fabricated using Torex's CMOS process. The series features a voltage reference, an error amplifier, a current limiter, a thermal protection circuit, and a phase compensation circuit plus a driver transistor.
The output voltage is selectable in 0.1V increments within the range of 1.2V to 5.0V. (Output voltage 1.2V, 1.5V, 1.8V, 2.5V, 3.0V, and 3.3V, are standard products. Other than these voltages are available as semi-custom products.)
The series is also compatible with low ESR ceramic capacitors, which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.
The over current protection circuit and the thermal shutdown circuit are built in. The over current protection circuit will operate when the output current reaches current limit level. The thermal shutdown circuit will operate when the junction temperature reaches temperature limit level.

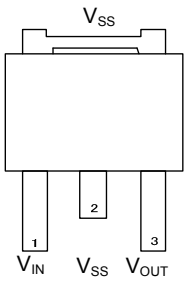
Features

Max. Output Current: 500mA (800mA limit)
Operating Voltage Range: 1.8V ~ 6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage: 1.2V, 1.5V, 1.8V, 2.5V, 3.0V, 3.3V (standard)
Other voltages between 1.2V ~ 5.0V (semi-custom)
Dropout Voltage: 500mV @ I_{OUT} = 500mA (V_{OUT}=3.3V)
Low Quiescent Current: 8 μA (TYP.)
Accuracy: ±2.0%
Ripple Rejection Rate: 40dB @ 1k Hz
Operating Ambient Temperature: - 40℃ ~ + 85℃
Packages: SOT-89, TO-252
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

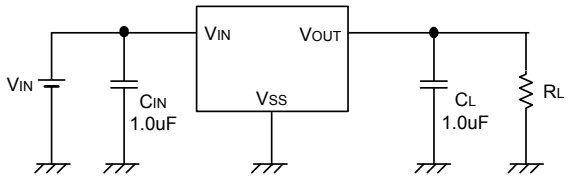


SOT-89 (TOP VIEW)



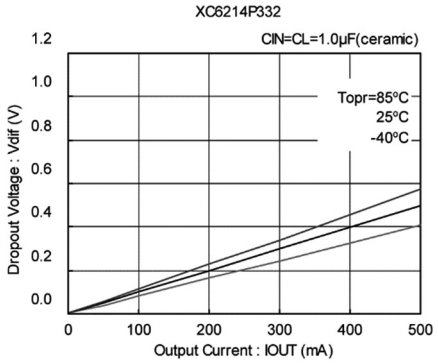
TO-252 (TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

Dropout Voltage vs. Output Current



Ordering Information

XC6214P①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	12	1.2V
		15	1.5V
		18	1.8V
		25	2.5V
		30	3.0V
		33	3.3V
③	Output Voltage Accuracy	2	±2.0%
④⑤-⑥(*1)	Packages (Order Unit)	JR-G	TO-252 (2,500pcs/Reel)
		PR-G	SOT-89 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6209 Series

300mA High Speed LDO Regulators with ON/OFF Control

RoHS Compliant, Halogen Antimony FREE

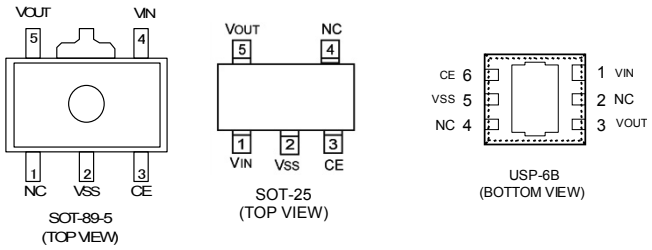
General Description

The XC6209 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves high ripple rejection and low dropout and consists of a voltage reference, an error amplifier, a current limiter and a phase compensation circuit plus a driver transistor.
Output voltage is selectable in 0.05V increments within a range of 0.9V ~ 6.0V.
The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.
The current limiter's foldback circuit also operates as a short protect for the output current limiter and the output pin.
The CE function enables the output to be turned off, resulting in greatly reduced quiescent current.

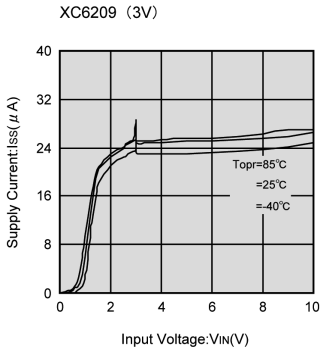
Features

Max. Output Current: 150mA (300mA = XC6209 E to H types)
Max. Operating Voltage: 2.0V ~ 10V
(Absolute Max. Rating: 12.0V)
Output Voltage Range: 0.9V~6.0V(0.05V increments)
Dropout Voltage: 200mV (I_{OUT}=100mA)
Low Quiescent Current: 25μA (TYP.)
Accuracy: ±2.0% (V_{OUT}>1.5V)
±30mV (V_{OUT}≤1.5V)
Stand-by Current: Less than 0.1μA (TYP.)
High Ripple Rejection: 70dB (10kHz)
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, USP-6B, SOT-89-5
Environmentally Friendly: EU RoHS Compliant, Pb Free

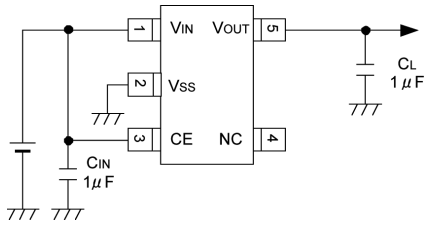
Pin Configuration



Typical Performance Characteristics



Typical Application Circuit



Ordering Information

XC6209①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
① (*2)	Type of Regulator CE Pin Logic	A/E	Active High (pull-down resistor built-in, semi-custom)
		B/F	Active High (no pull-down resistor built-in, standard)
		C/G	Active Low (pull-up resistor built-in, semi-custom)
		D/H	Active Low (no pull-up resistor built-in, standard)
②③	Output Voltage	09~60	e.g. 20:2.0V, 30:3.0V,
④	Output Voltage Accuracy	2	0.1V increments, ±2.0% accuracy (*3) e.g. ②=2, ③=8, ④=2 → 2.80V, ±2.0%
		1	0.1V increments, ±1.0% accuracy (*3) e.g. ②=2, ③=8, ④=1 → 2.80V, ±1.0%
		A	0.05V increments, ±2.0% accuracy (*3) e.g. ②=2, ③=8, ④=A → 2.85V, ±2.0%
		B	0.05V increments, ±1.0% accuracy (*3) e.g. ②=2, ③=8, ④=B → 2.85V, ±1.0%
⑤⑥-⑦ (*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) Max. output current of XC6209E to H series depend on the setting voltage.
(*3) Within ±30mV (V_{OUT}≦1.5V)

XC6206 Series

1μA Low Power 3 Terminal Voltage Regulator

RoHS Halogen Antimony FREE

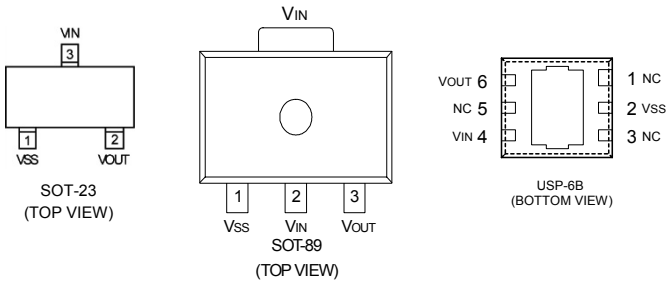
General Description

The XC6206 series are highly precise, low quiescent current, high voltage, positive voltage regulators manufactured using CMOS and laser trimming technologies. The series provide high currents with a significantly low dropout voltage.
The XC6206 series consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error correction circuit.
The series are compatible with low ESR ceramic capacitors. The current limiter's foldback circuit also operates as a short protect for the output current limiter and the output pin.
Output voltage can be set internally by laser trimming technologies. It is selectable in 0.1V increments within a range of 1.2V to 5.0V.

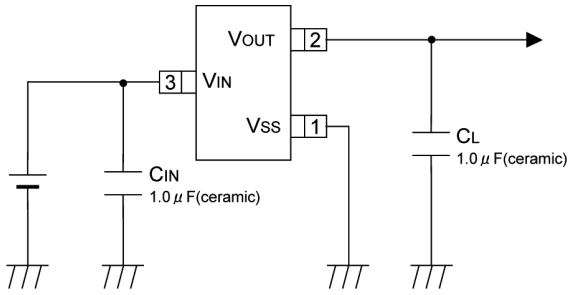
Features

Max. Output Current: 200mA (3.0V type)
Max. Operating Voltage: 6.0V (Absolute Max. Rating: 7.0V)
Output Voltage Range: 1.2V ~ 5.0V (0.1V increments)
Dropout Voltage: 250mV @ IOUT=100mA (3.0V type)
Low Quiescent Current: 1.0 μA(TYP.)
Accuracy: ±2.0% (±30mV@VOUT<1.5V)(±1.0%@VOUT≧2.0V)
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-23, SOT-89, USP-6B
Environmentally Friendly: EU RoHS Compliant, Pb Free

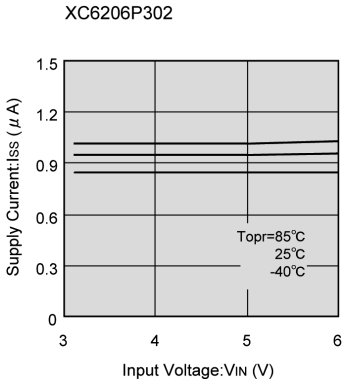
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6206P①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	12 ~ 50	e.g. VOUT:3.0V→①=3, ②=0
③	Output Voltage Accuracy	2	± 2.0% @ VOUT≧1.5V, ± 30mV @ VOUT<1.5V
		1	± 1.0% @ VOUT≧2.0V
④⑤-⑥(*1)	Packages (Order Unit)	MR-G	SOT-23 (3,000pcs/Reel)
		PR-G	SOT-89 (1,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6206J Series

Low Consumption Current Regulators

RoHS Halogen Antimony FREE

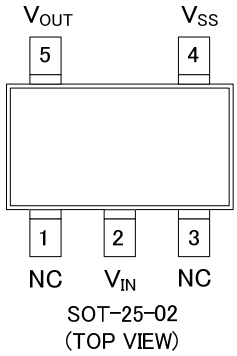
General Description

XC6206J series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves very low supply current, 1.0μA (TYP.) and consists of a reference voltage source, an error amplifier, current limit circuit, and a phase compensation circuit plus a driver transistor.
The series is also compatible with low ESR ceramic capacitors (C_L), which give added output stability.
The current limiter's fold-back circuit also operates as a short protect for the output current limiter and the output pin.

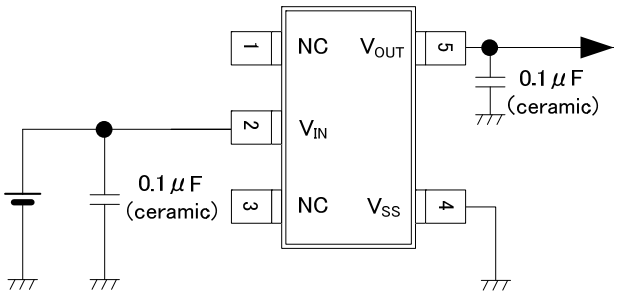
Features

Maximum Output Current: 200mA
Dropout Voltage: 200mV@IOUT=100mA (V_{OUT}=3.0V)
Operating Voltage Range: 1.5V ~ 6.0V (Absolute Max. Rating: 7.0V)
Output Voltage: 0.9 ~ 4.0V (0.1V increments)
Low Consumption Current: 1.0μA (TYP.)
Protection Circuit: Current Limit 300mA (TYP.)
Short Circuit Protection 50mA (TYP.)
External Capacitor: 0.1μF~1.0μF
Operating Ambient Temperature: - 40℃～+85℃
Package: SOT-25-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

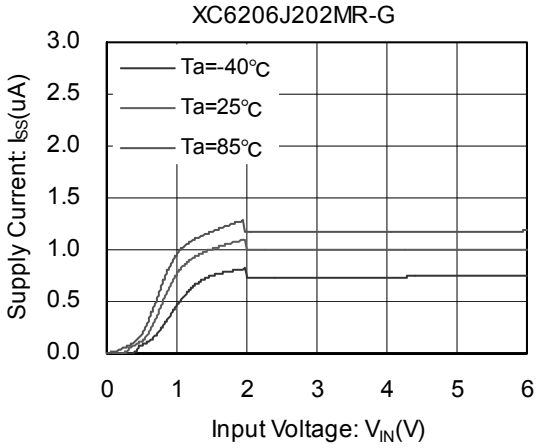


Typical Application Circuit



Typical Performance Characteristics

●Supply Current vs. Input Voltage



Ordering Information

XC6206J①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	09～40	Output voltage ex.) 3.0V ⇒ ①= 3, ②= 0
③	Output Voltage Accuracy	2	±2% ($V_{OUT(T)}$≧1.5V), ±30mV($V_{OUT(T)}$<1.5V)
④⑤-⑥(*1)	Package (Order Unit)	MR-G	SOT-25-02 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6204/XC6205 Series

300mA/150mA High Speed LDO Regulators with CE Pin

RoHS Halogen Antimony FREE

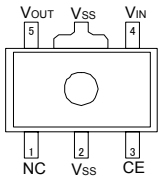
General Description

The XC6204/XC6205 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves high ripple rejection and low dropout and consists of a voltage reference, an error amplifier, a current limiter, and phase compensation circuit plus a driver transistor.
Output voltage is selectable in 0.05V increments within a range of 0.9V ~ 6.0V.
The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.
The current limiter's foldback circuit also operates as a short protect for the output current limiter and the output pin.
The CE function enables the output to be turned off, resulting in greatly reduced quiescent current.

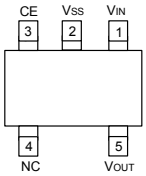
Features

Max. Output Current: 150mA
300mA (XC6204E~H Series)
Operating Voltage: 2.0V ~ 10V (Absolute Max. Rating: 12.0V)
Output Voltage Range: 0.9V ~ 1.75V [XC6205] (0.05V increments)
1.8V ~ 6.0V [XC6204] (0.05V increments)
Dropout Voltage: 200mV @ 100mA
Low Quiescent Current: 70μA (TYP.)
Accuracy: ± 2.0%, ± 1.0%,
Stand-by Current: Less than 0.1μA (TYP.)
High Ripple Rejection: 70dB (10 kHz) (XC6204)
60dB (10 kHz) (XC6205)
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-23, SOT-89-5, USP-6B
Environmentally Friendly: EU RoHS Compliant, Pb Free

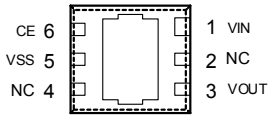
Pin Configuration



SOT-89-5
(TOP VIEW)

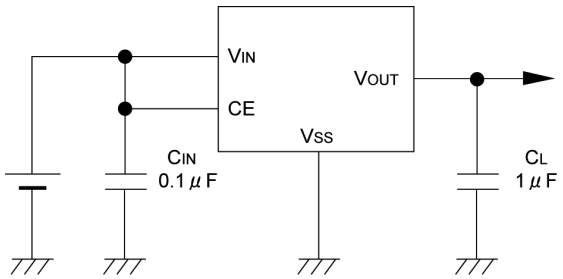


SOT-25
(TOP VIEW)



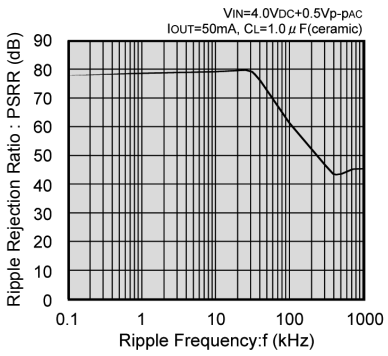
USP-6B
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

XC6204x302



Ordering Information

XC6204/6205①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
① (*2)	Type of Regulator (CE pin Logic)	A / E	Active High, pull-down resistor built-in (Semi-Custom)
		B / F	Active High, no pull-down resistor built-in
		C / G	Active Low, pull-up resistor built-in (Semi-Custom)
		D / H	Active Low, no pull-up resistor built-in (Semi-Custom)
②③	Output Voltage	09~60,	e.g. VOUT=2.0V→②=2, ③=0
④	Output Voltage Accuracy	2	0.1V increments, ±2.0% accuracy e.g. VOUT=3.8V, ±2.0%→②=3, ③=8, ④=2
		1 (*3)	0.1V increments, ±1.0% accuracy e.g. VOUT=3.0V, ±1.0%→②=3, ③=0, ④=1
		A	0.05V increments, ±2.0% accuracy e.g. VOUT=3.85V, ±2.0%→②=3, ③=8, ④=A
		B (*3)	0.05V increments, ±1.0% accuracy e.g. VOUT=3.05V, ±1.0%→②=3, ③=0, ④=B
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) E to H types are compatible to 300mA of XC6204 series.
(*3) Output voltage range of the ±1% accuracy product is 2.95V to 6.0V.

XC6201 Series

10V Input 3 Terminal, Low Power Voltage Regulator

RoHS Halogen Antimony FREE

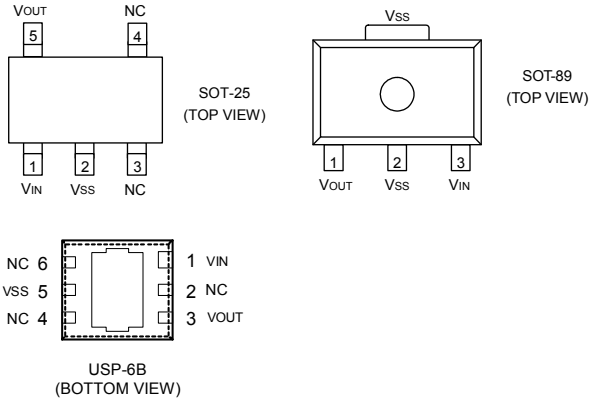
General Description

The XC6201 series are precise, low quiescent current, positive voltage regulators manufactured using CMOS and laser trimming technologies.
The series provides high current with a significantly low dropout voltage.
The XC6201 series consist of a current limiter circuit, a driver transistor, a precision reference voltage and an error amplifier. Output voltage is selectable in 0.1V steps between a voltage of 1.3V and 6.0V.
SOT-25, SOT-89 and USP-6B packages are available.

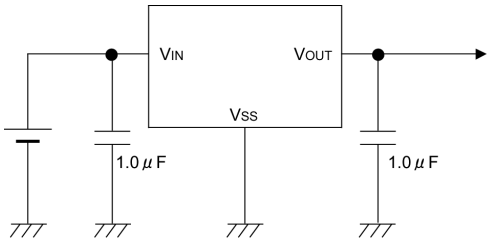
Features

Max. Output Current: 200mA(TYP.)
Max. Operating Voltage: 10V
(Absolute Max. Rating: 12.0V)
Output Voltage Range: 1.3V ~ 6.0V (0.1V increments)
Dropout Voltage: 0.16V @100mA
Low Quiescent Current: 2.0 μA(TYP.)
Accuracy: ± 1.0% (V_{OUT} ≧2.0V)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, SOT-89, USP-6B
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

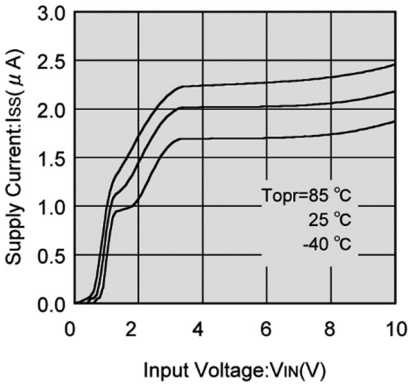


Typical Application Circuit



Typical Performance Characteristics

XC6201P332



Ordering Information

XC6201P①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②	Output Voltage	13 ~ 60	e.g. 30:3.0V 50:5.0V
③	Output Voltage Accuracy	1	± 1.0% (V_{OUT} ≧2.0V)
		2	± 2.0%
④⑤-⑥(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89 (1,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC62FJ Series

10V Input, 200mA Low Consumption Current Regulator

RoHS Halogen Antimony FREE

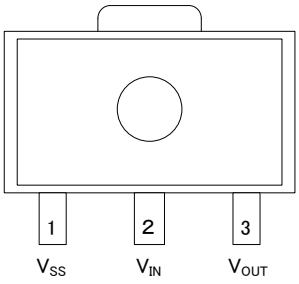
General Description

The XC62FJ series is a highly precise, low power consumption, positive voltage regulator manufactured with CMOS and laser trimming technologies.
The series provides large currents with a significantly small dropout voltage.
The XC62FJ consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error amplifier.
The output voltage is selectable in 0.1V steps between 1.7V ~ 6.0V.

Features

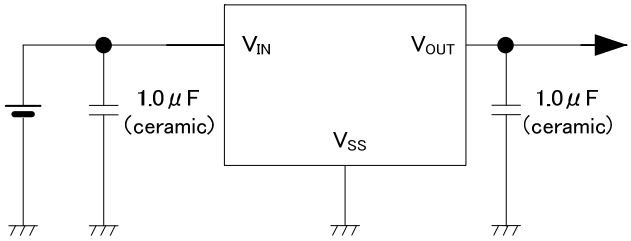
Max. Output Current: 200mA
Dropout Voltage: 160mV@I_{OUT}=100mA (V_{OUT}=5.0V)
Operating Voltage Range: 1.8V～10V (Absolute Max. Rating: 12.0V)
Output Voltage Range: 1.7V～6.0V (±2.0%) 0.1V increments
Consumption Current: 2.0μA (TYP.)
External Capacitor: Ceramic Capacitor
Operating Ambient Temperature: -40℃～+85℃
Package: SOT-89
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



SOT-89
(TOP VIEW)

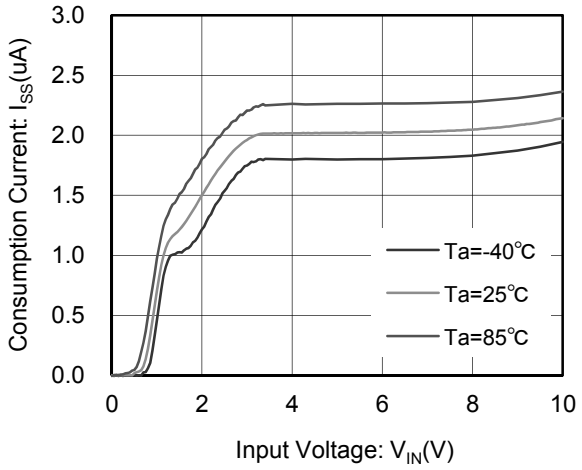
Typical Application Circuit



Typical Performance Characteristics

●Consumption Current vs. Input Voltage

XC62FJ3302PR-G



Ordering Information

XC62FJ①②③④⑤⑥-⑦

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①②	Output Voltage	17～60	e.g. 30: 3.0V, 50: 5.0V
③④	Output Voltage Accuracy	02	±2.0%
⑤⑥-⑦(*1)	Package (Order Unit)	PR-G	SOT-89 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6604 Series

1A, 0.5V Low Input Voltage, High Speed LDO Regulator (Adjustable Current Limit)

RoHS Halogen Antimony FREE

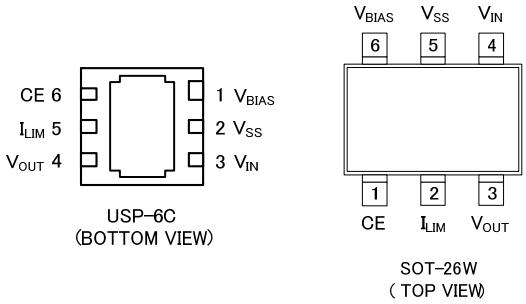
General Description

The XC6604 series is a low voltage input (0.5V) operation and provides high accuracy ±15mV / ±20mV and can supply large current efficiently due to its ultra low on-resistance even at low output voltages.
The series is ideally suited to the applications which require high current in low input/output voltages and consists of a N-ch driver transistor, a voltage reference, an error amplifier, a current limiter, a fold-back circuit, a thermal shutdown (TSD) circuit, an under voltage lock out (UVLO) circuit, a soft-start circuit and a phase compensation circuit.
Output voltage is selectable in 0.1V increments within a range of 0.5V to 1.8V using laser trimming technology and ceramic capacitors can be used for the output stabilization capacitor (C_L). When the output current reaches the current limit, the output voltage drops as well as the output current is decreased as a function of the foldback circuit. The current limit can be adjustable with connecting a resistor to the I_{LIM} pin.
The CE function enables the output to be turned off and the series to be put in stand-by mode resulting in greatly reduced power consumption. At the time of entering the stand-by mode, the series enables the electric charge at the output capacitor (C_L) to be discharged via the internal switch. As a result the V_{OUT} pin quickly returns to the V_{SS} level.
The CE pull-down function keeps the IC to be in stand-by mode even if the CE pin is left open.

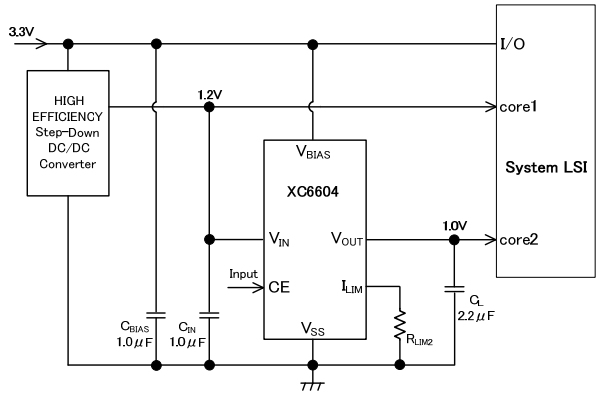
Features

Max. Output Current: 1.0A (1.3A Limit)
Input Voltage Range: 0.5V～3.0V
Output Voltage Range: 0.5V～1.8V (0.1V increments)
Low Quiescent Current: 100μA (V_{BIAS}), 6.5μA (V_{IN})@V_{OUT}=1.2V
ON Resistance: 0.15Ω@V_{BIAS}=3.6V, V_{OUT}=1.2V
Bias Voltage Range: 2.5V～6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Accuracy: ±0.015V@V_{OUT}＜1.2V
±0.020V@V_{OUT}≧1.2V
Ripple Rejection: 60dB@f=1kHz (V_{BIAS_PSRR})
75dB@f=1kHz (V_{IN_PSRR})
Stand-by Current: 0.01μA (V_{BIAS}), 0.01μA (V_{IN})
Under-voltage Lockout: 1.8V (V_{BIAS}), 0.4V (V_{IN})
Thermal Shutdown: 150℃@detect, 125℃@release
Protection Circuit: Foldback Current Limit,
Thermal Shutdown, UVLO
Functions: Soft-start
CE Pull-down (Active High)
C_L High-speed Discharge
Output Capacitor: Ceramic Capacitor Compatible (2.2μF)
Operating Ambient Temperature: -40℃～+85℃
Packages: USP-6C, SOT-26W
Environmentally Friendly: EU RoHS Compliant, Pb Free

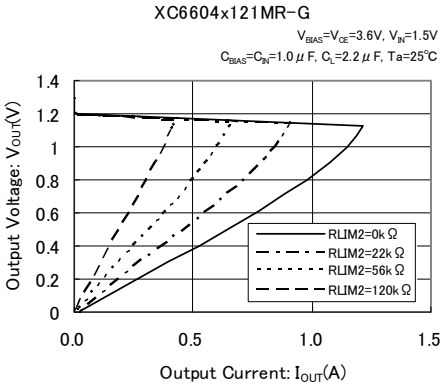
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6604①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	With Soft-start, Adjustable Current Limit with an external resistor
		B	Without Soft-start, Adjustable Current Limit with an external resistor
②③	Output Voltage	05～18	e.g. 1.2V → ②=1, ③=2
④	Output Voltage Accuracy	1	±0.015V (V_{OUT}＜1.2V), ±0.020V (V_{OUT}≧1.2V)
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-26W (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6603 Series

1A, 0.5V Low Input Voltage, High Speed LDO Regulator (Adjustable Soft-start)

RoHS Halogen Antimony FREE

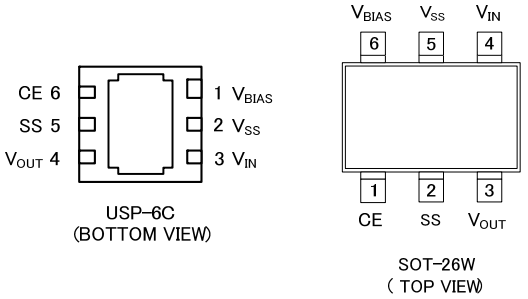
General Description

The XC6603 series is a low voltage input (0.5V) operation and provides high accuracy ±15mV / ±20mV and can supply large current efficiently due to its ultra low on-resistance even at low output voltages.
The series is ideally suited to the applications which require high current in low input/output voltages and consists of a N-ch driver transistor, a voltage reference, an error amplifier, a current limiter, a foldback circuit, a thermal shutdown (TSD) circuit, an under voltage lock out (UVLO) circuit, a soft-start circuit and a phase compensation circuit.
Output voltage is selectable in 0.1V increments within a range of 0.5V to 1.8V using laser trimming technology and ceramic capacitors can be used for the output stabilization capacitor (C_L). The inrush current (I_{RUSH}) from V_{IN} to V_{OUT} for charging C_L at start-up can be reduced and makes the V_{IN} stable. Soft-start time can be adjustable with connecting a capacitor to the SS pin. The inrush current conflicts with the soft-start time, therefore if soft-start is set longer, the inrush current is decreased.
The CE function enables the output to be turned off and the series to be put in stand-by mode resulting in greatly reduced power consumption. At the time of entering the stand-by mode, the series enables the electric charge at the output capacitor (C_L) to be discharged via the internal switch. As a result the V_{OUT} pin quickly returns to the V_{SS} level.
The CE pull-down function keeps the IC to be in stand-by mode even if the CE pin is left open.

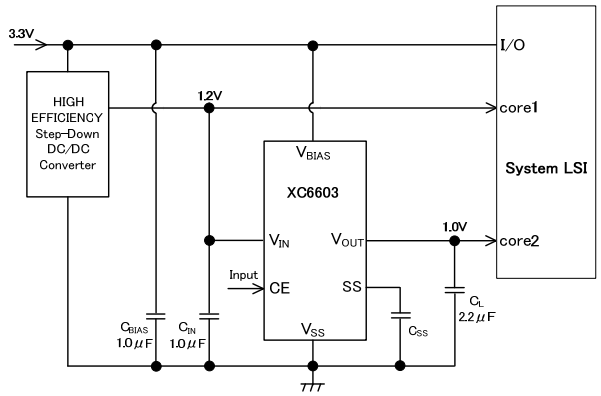
Features

Max. Output Current: 1.0A (1.3A Limit)
Input Voltage Range: 0.5V～3.0V
Output Voltage Range: 0.5V～1.8V (0.1V increments)
Low Quiescent Current: 100μA (V_{BIAS}), 6.5μA (V_{IN})@V_{OUT}=1.2V
ON Resistance: 0.15Ω@V_{BIAS}=3.6V, V_{OUT}=1.2V
Bias Voltage Range: 2.5V～6.0V (Absolute Max. Rating: 6.5V)
Output Voltage Accuracy: ±0.015V@V_{OUT}＜1.2V
±0.020V@V_{OUT}≧1.2V
Ripple Rejection: 60dB@f=1kHz (V_{BIAS_PSRR})
75dB@f=1kHz (V_{IN_PSRR})
Stand-by Current: 0.01μA (V_{BIAS}), 0.01μA (V_{IN})
Under-voltage Lockout: 1.8V (V_{BIAS}), 0.4V (V_{IN})
Thermal Shutdown: 150℃@detect, 125℃@release
Protection Circuit: Foldback Current Limit, Thermal Shutdown, UVLO
Functions: Adjustable Soft-start time with an external capacitor
CE Pull-down (Active High)
C_L Auto Discharge
Output Capacitor: Ceramic Capacitor Compatible (2.2μF)
Operating Ambient Temperature: -40℃～+85℃
Packages: USP-6C, SOT-26W
Environmentally Friendly: EU RoHS Compliant, Pb Free

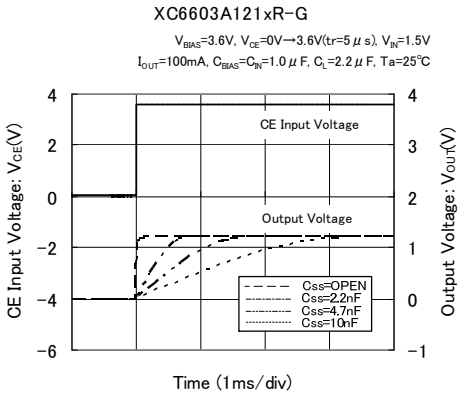
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6603①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Adjustable Soft-start time with an external capacitor
②③	Output Voltage	05～18	e.g. 1.2V → ②=1, ③=2
④	Output Voltage Accuracy	1	±0.015V (V_{OUT}＜1.2V), ±0.020V (V_{OUT}≧1.2V)
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-26W (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6602 Series 1A, 0.5V Input Voltage, High Speed LDO Regulator

RoHS Halogen Antimony FREE

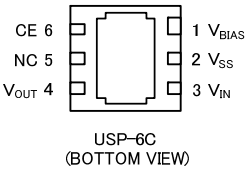
General Description

The XC6602 series is a low voltage input (0.5V) operation and provides high accuracy ±15mV/±20mV and can supply large current efficiently due to its ultra low on-resistance even at low output voltages.
The series is ideally suited to the applications which require high current in low input/output voltages and consists of a N-ch driver transistor, a voltage reference, an error amplifier, a current limiter, a fold-back circuit, a thermal shutdown (TSD) circuit, an under voltage lock out (UVLO) circuit, a soft-start circuit and a phase compensation circuit.
Output voltage is selectable in 0.1V increments within a range of 0.5V to 1.8V using laser trimming technology and ceramic capacitors can be used for the output stabilization capacitor (C_L). The inrush current (I_{RUSH}) from V_{IN} to V_{OUT} for charging C_L at start-up can be reduced and makes the V_{IN} stable. The soft-start time is optimized internally.
The CE function enables the output to be turned off and the series to be put in stand-by mode resulting in greatly reduced power consumption. At the time of entering the stand-by mode, the series enables the electric charge at the output capacitor (C_L) to be discharged via the internal switch. As a result the V_{OUT} pin quickly returns to the V_{SS} level.
The CE pull-down function keeps the IC to be in stand-by mode even if the CE pin is left open.

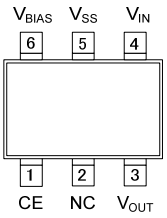
Features

Max. Output Current: 1.0A (1.3A Limit)
Input Voltage Range: 0.5V ~ 3.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Range: 0.5V ~ 1.8V (0.1V increments)
Low Quiescent Current: V_{BIAS}=100μA, V_{IN}=6.5μA@V_{OUT}=1.2V
ON Resistance: 0.15Ω@V_{BIAS}=3.6V, V_{OUT}=1.2V
Bias Voltage Range: 2.5V ~ 6.0V
Output Voltage Accuracy: ±0.015V@V_{OUT}＜1.2V
±0.020V@V_{OUT}≧1.2V
Ripple Rejection: V_{BIAS_PSRR}=60dB@f=1kHz
V_{IN_PSRR}=75dB@f=1kHz
Stand-by Current: V_{BIAS}=0.01μA, V_{IN}=0.01μA
UVLO: V_{BIAS}=1.8V, V_{IN}=0.4V
Thermal Shutdown: 150°C@detect, 125°C@release
Protection Circuit: Fold-back Current Limit, TSD, UVLO
Functions: Built-in Soft-start
CE Pull-down (Active High)
C_L Auto Discharge
Output Capacitor: Ceramic Capacitor Compatible (2.2μF)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: USP-6C, SOT-26W, SOT-89-5, WLP-5-02
Environmentally Friendly: EU RoHS Compliant, Pb Free

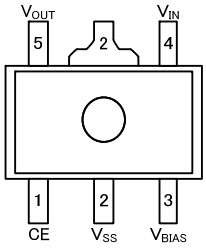
Pin Configuration



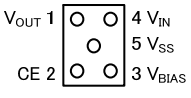
USP-6C
(BOTTOM VIEW)



SOT-26W
(TOP VIEW)

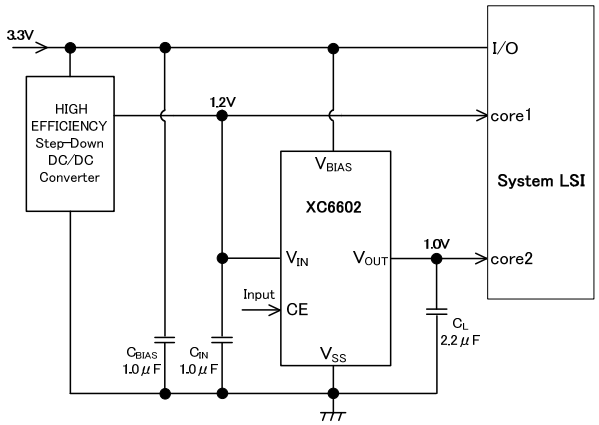


SOT-89-5
(TOP VIEW)

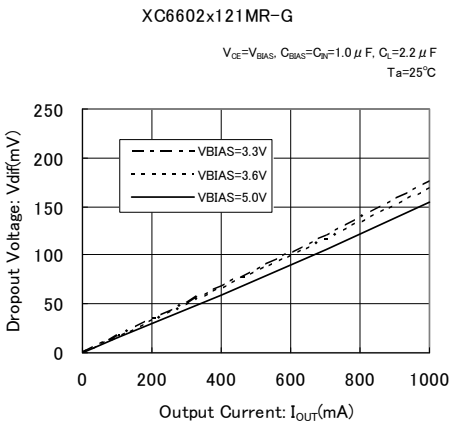


WLP-5-02
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6602①②③④⑤⑥-⑦ With soft-start circuit built-in, can be selected from with or without functions

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Soft-start included
		B	Soft-start excluded
②③	Output Voltage	05~18	e.g. 1.2V → ②=1, ③=2
④	Output Voltage Accuracy	1	±0.015V (V_{OUT}＜1.2V), ±0.020V (V_{OUT}≧1.2V)
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-26W (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		0R-G	WLP-5-02 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6601 Series

400mA Low Voltage Input LDO Voltage Regulators with Soft-start Function

RoHS Halogen Antimony FREE

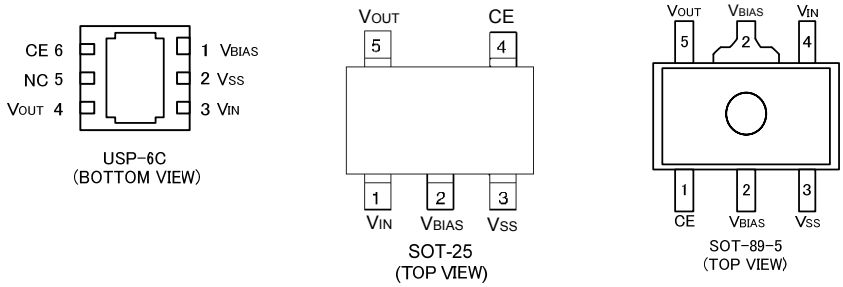
General Description

The XC6601 series is a CMOS LDO voltage regulator with precise (± 20mV) outputs which enables the operation in ultra low On resistance even where low output voltages to achieve high efficiency of the output current. The series is suited for the application which requires low dropout voltage operation. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a fold back circuit, a thermal shutdown (TSD) circuit, a Under Voltage Lock Out (UVLO) and a phase compensation circuit.
The output voltage is selectable in 0.05V increments within the range of 0.7V to 1.8V using laser trimming technologies. The output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors.
The over current protection circuit (the current limiter and the fold back circuit) and the thermal shutdown circuit (the TSD circuit) are built-in. These two protection circuits will operate when the output current reaches limit level or the junction temperature reaches temperature limit level.
With the built-in UVLO function, the regulator output is forced OFF when the V_{BIAS} pin or the V_{IN} pin becomes the UVLO voltage or lower.
The CE function enables the output to be turned off and the series becomes a stand-by mode resulting in greatly reduced power consumption. At the time of entering the stand-by mode, the series enables the electric charge at the output capacitor (C_L) to be discharged via the internal auto-discharge switch placed between the V_{OUT} pin and the V_{SS} pin, as a result the V_{OUT} pin quickly returns to the V_{SS} level.

Features

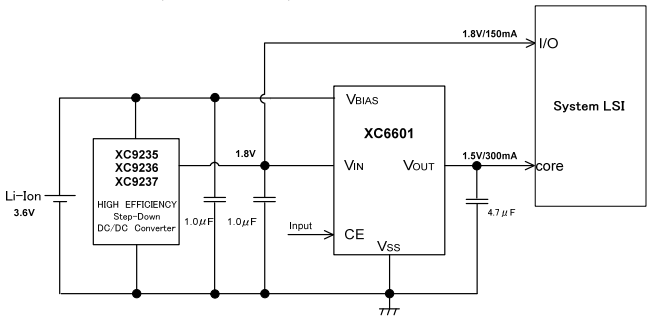
Max. Output Current: 400mA (Limiter 500mA TYP.)
Input Voltage Range: 1.0V ~ 3.0V
(Absolute Max. Rating: 7.0V)
($V_{IN} \leqq V_{BIAS}$)
Output Voltage Range: 0.7V ~ 1.8V (0.05V increments)
Dropout Voltage: 35mV@I_{OUT}=100mA (TYP.)
(at V_{BIAS} - V_{OUT}=2.4V)
Low Quiescent Current: I_{BIAS}=25μA , I_{IN}=1.0μA (TYP.)
I_{BIAS}=0.01μA , I_{IN}=0.01μA (TYP.)
Bias Voltage Range: 2.5V ~ 6.0V
(V_{BIAS} - $V_{OUT} \geqq$0.9V)
Output Voltage Accuracy: ±20mV
UVLO: V_{BIAS}=2.0V, V_{IN}=0.4V (TYP.)
Thermal Shutdown (Detect/Release): 150℃/125℃ (TYP.)
C_L High Speed Auto-Discharge
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40℃ ~ +85℃
Packages: USP-6C, SOT-25, SOT-89-5
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



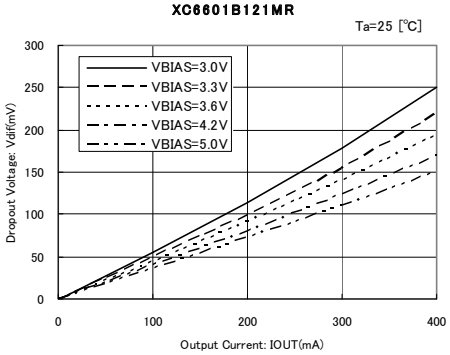
Typical Application Circuit

●V_{BIAS} =3.6V , V_{IN} =1.5V , V_{OUT} =1.2V



Typical Performance Characteristics

●Dropout Voltage vs. Output Current



Ordering Information

XC6601①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulators	A	Pull-down Resistor Built-in
		B	No Pull-down Resistor Built-in
②③	Output Voltage	07 ~ 18	e.g.) $V_{OUT(T)}$=1.2V⇒②=1,③=2
④	Output Voltage	1	0.1V increments e.g.) 1.2V⇒②=1,③=2,④=1
		B	0.05V increments e.g.) 1.25V⇒=1,③=2,④=B
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6505 Series

Low Quiescent Current, 200mA High Speed LDO Regulator - 10.5V Input

RoHS Halogen Antimony FREE

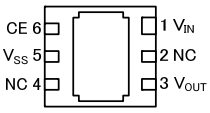
General Description

Even the XC6505 series is a low quiescent current such as 5.5μA, the IC is a high speed CMOS LDO regulator that features high accurate, low noise, high ripple rejection, and low dropout. The series consists of a voltage reference, an error amplifier, a driver transistor, a current limiter, a phase compensation circuit and a thermal shutdown circuit.
The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the series enables the electric charge at the output capacitor C_L to be discharged via the internal switch, and as a result the V_{OUT} pin quickly returns to the V_{SS} level.
The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature detection level.

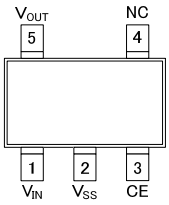
Features

Max. Output Current: 200mA
Input Voltage Range: 1.7V ~ 10.5V
(Absolute Max. Rating: 12.0V)
Output Voltage Range: 1.5V ~ 8.0V (0.1V increments)
Dropout Voltage: 190mV@V_{OUT}=3.3V, I_{OUT}=100mA
Low Quiescent Current: 5.5μA (TYP.)
Accuracy: ±1.0% (2.0V ~ 8.0V)
±20mV (1.5V ~ 1.9V)
Temperature Stability: ±30ppm/°C
High Ripple Rejection: 60dB @ 1kHz
Protection: Current Limiter (300mA, TYP.)
Short Circuit Protection (110mA, TYP.)
Thermal Shutdown
ON/OFF Function: Active High (CE Pull-down)
0.1μA (Stand-by)
Operating Ambient Temperature: -40 ~ +105°C
Packages: USP-6C, SOT-25, SOT-89-5
Environmentally Friendly: EU RoHS Compliant, Pb Free

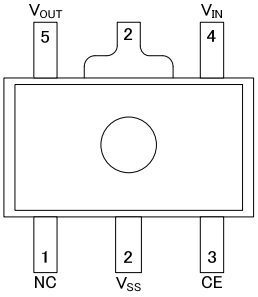
Pin Configuration



USP-6C
(BOTTOM VIEW)

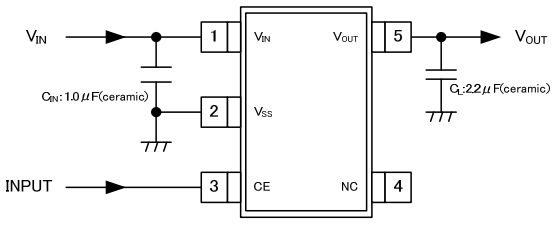


SOT-25
(TOP VIEW)



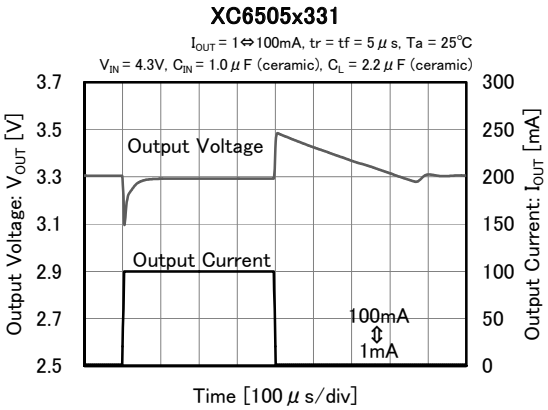
SOT-89-5
(TOP VIEW)

Typical Application Circuit



SOT-25
(TOP VIEW)

Typical Performance Characteristics



Ordering Information

XC6505①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulators	A	without CE Pull-down, without C_L Discharge
		B (The Recommended Type)	without CE Pull-down, with C_L Discharge
②③	Output Voltage	15~80	e.g. 2.8V → ②=2, ③=8
④	Output Voltage Accuracy	1	±1.0% (2.0V~8.0V) ±20mV (1.5V~1.9V)
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) With CE Pull-down, please contact your local Torex sales office or representative.

XC6504 Series

0.6μA Ultra Low Quiescent Current Small Voltage Regulator (C_L Capacitor-less)

RoHS Halogen Antimony FREE

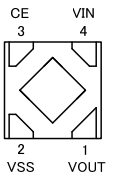
General Description

The XC6504 series is a highly accurate CMOS voltage regulator that achieves very low quiescent current operation of 0.6μA. Even output current is 1μA (when light load), the XC6504 can provide high accurate outputs, which is ideally suited for the applications to draw less output current. The usage of super small package USPN-4B02 (0.75 x 0.95mm) and the advantage of capacitor-less stable operation can contribute the board space saving outstandingly. The IC consists of a reference voltage source, an error amplifier, a driver transistor, over-current protection circuit, and a phase compensation circuit.
The device is compatible with a low ESR ceramic output capacitor C_L. Moreover, the device can provide stable output even without a C_L output capacitor because of the excellent internal phase compensation.
Output voltage is fixed internally by laser trimming technology and can be selectable in 0.1V increments within the range of 1.1V to 5.0V. The CE function enables the device to be put into standby mode by inputting a low level signal to the CE pin thereby reducing current consumption to less than 0.1μA. In the standby mode, if a C_L output capacitor is used, the electric charge stored at C_L can be discharged via the internal switch and as a result, the V_{OUT} pin quickly returns to the V_{SS} level.

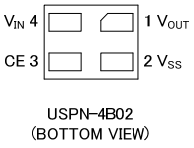
Features

Max. Output Current: 150mA
Input Voltage Range: 1.4V～6.0V
(Absolute Max. Rating: 6.5V)
Output Voltage Range: 1.1V～5.0V (0.1V increments)
Quiescent Current: 0.6μA (V_{OUT}＜1.9V)
Output Accuracy: ±0.02V@V_{OUT}＜2.0V
±1.0%@V_{OUT}≧2.0V
Temperature Stability: ±50ppm/℃
Low On Resistance: 3.3Ω@V_{OUT}=3.0V
Standby Current: 0.01μA
Protection Current: Current Limiter
Shot Circuit Protection
CE Function: C_L Auto Discharge
ON/OFF Logic=Enable High
Output Capacitor: Low ESR Ceramic Capacitor
(C_L Capacitor-Less Compatible)
Operating Ambient Temperature: -40℃～+85℃
Packages: USPQ-4B04
USPN-4B02
SSOT-24
SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



USPQ-4B04
(BOTTOM VIEW)



USPN-4B02
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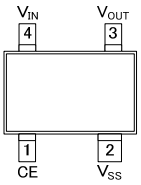
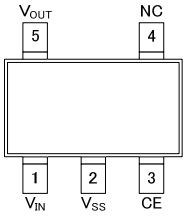
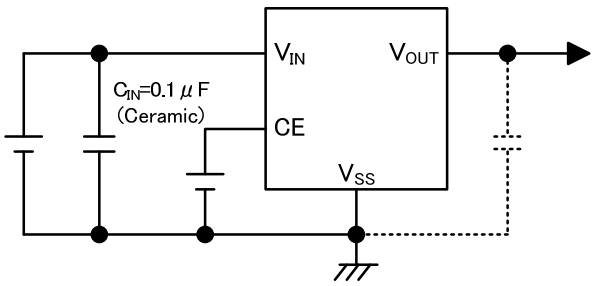


SSOT-24
(TOP VIEW)

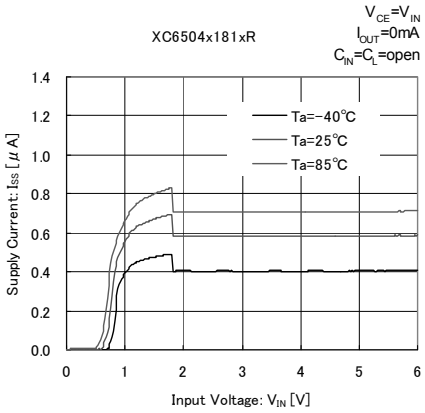


SOT-25
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6504①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	With Current limiter, CE pull-down resistor, C_L Auto discharge
②③	Output Voltage	11~50	e.g. 1.8V → ②=1, ③=8
④	Output Voltage Accuracy	1	±0.02V (V_{OUT}＜2.0V), ±1.0% (V_{OUT}≧2.0V)
⑤⑥-⑦(*1)	Packages (Order Unit)	9R-G	USPQ-4B04 (3,000pcs/Reel)
		7R-G	USPN-4B02 (5,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6503 Series

C_L Capacitor-less 500mA Low Quiescent Current High Speed LDO Regulator

RoHS Compliant, Halogen Antimony FREE

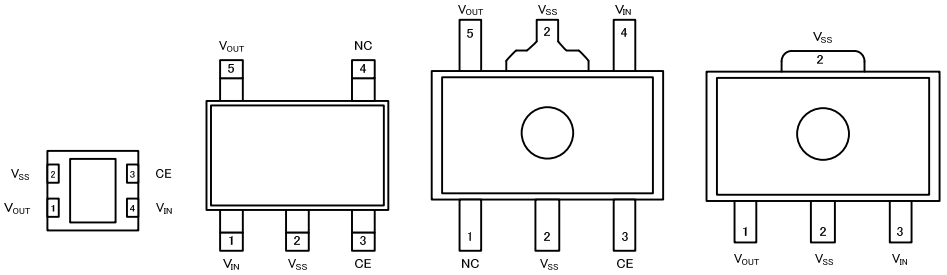
General Description

The XC6503 series is a 500mA high speed CMOS LDO regulator that can provide stable output voltages even without a load capacitor C_L. The devices are available in fixed output voltage from 1.2V to 5.0V in 0.05V increments.
The C_L capacitor-less is possible because phase compensation is carried out internally unlike other LDOs where it is done externally. It results in saving board design space. The current limit fold-back circuit and thermal shutdown circuit work as protection circuit. The XC6503P is a 3-Terminal regulator and the XC6503D has a chip enable function, which enables the entire circuit to be turned off by a low level input signal to the CE pin.
When a C_L capacitor is used, the IC can discharge the electric charge stored at the output capacitor through the internal switch while in standby state, and as a result the V_{OUT} quickly returns to the V_{SS} level.

Features

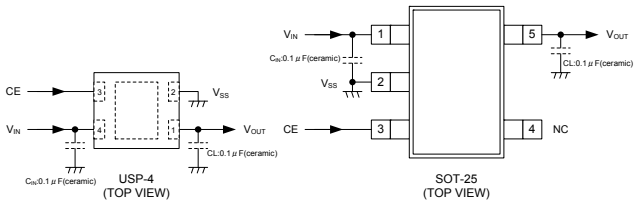
Max. Output Current:	500mA
Input Voltage Range:	1.7V ~ 6.0V (Absolute Max. Rating:6.5V)
Output Voltage Range:	1.2V ~ 5.0V （0.05V increments）
Dropout Voltage:	190mV@V_{OUT}=2.8V, I_{OUT} =300mA
Low Quiescent Current:	15 μA (TYP.), 0.1 μA (stand-by)
Output Accuracy:	±1.0% (2.0V ~ 5.0V) ±20mV (1.2V ~ 1.95V)
Temperature Stability:	±30ppm/°C
High Ripple Rejection:	55dB@1kHz, V_{OUT}=2.8V
Protection Current:	Current Limiter （630mA TYP.） Short Circuit Protection Thermal Shutdown
C_L Capacitor-less:	Internal Phase Compensation
Operating Ambient Temperature:	-40°C ~ +85°C
Packages:	USP-4, SOT-25, SOT-89-5 (XC6503D), SOT-89 (XC6503P)
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration

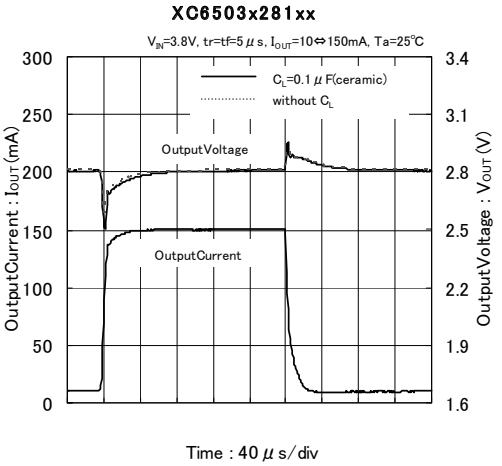


USP-4 (BOTTOM VIEW) SOT-25 (TOP VIEW) SOT-89-5 (TOP VIEW) SOT-89 (TOP VIEW)

Typical Application Circuits



Typical Performance Characteristics



Ordering Information

XC6503D with ON/OFF function
XC6503①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulator (*2)	D	CE Active High, with CE Pull-down, C_L discharge
②③	Output Voltage (*3)	12~50	e.g) ②=2、③=8 → 2.8V
④	Output Voltage Accuracy	1	±0.02V (1.2~1.9V), ±1.0% (2.0~5.0V)
⑤⑥-⑦(*1)	Packages (Order Unit)	GR-G	USP-4 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For without CE Pull-down or without C_L discharge function, please contact your local Torex sales office or representative.
(*3) For the output voltage in 0.05V increments, please contact your local Torex sales office or representative.

XC6503P 3-Terminal regulator
XC6503①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type of Regulator	P	3-Terminal regulator, without CE pin
②③	Output Voltage (*2)	12~50	e.g) ②=2、③=8 → 2.8V
④	Output Voltage Accuracy	1	±0.02V (1.2~1.9V) ,±1.0% (2.0~5.0V)
⑤⑥-⑦(*1)	Packages (Order Unit)	PR-G	SOT-89 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.
(*2) For the output voltage in 0.05V increments, please contact your local Torex sales office or representative.

XC6501 Series

C_L Capacitor-less, Low Quiescent Current, 200mA High Speed LDO Regulator

RoHS Halogen Antimony FREE

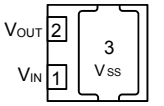
General Description

The XC6501 series is a 6.0V high speed, low noise CMOS LDO regulator that can provide stable output voltages within a range of 1.2V to 5.0V (0.05V increments) even without a load capacitor C_L. This is possible because phase compensation is carried out internally unlike other LDOs where it is done externally. The series consists of a reference voltage source, driver transistor, error amplifier, current limit circuit, and phase compensation circuit.
The CE function enables the circuit to be put into stand-by mode by inputting a low level signal to the CE pin thereby reducing current consumption from an already low 13μA (in operation) to less than 0.1μA. In the stand-by mode, if a C_L cap is used, the electric charge stored at C_L can be discharged via the internal auto-discharge switch and as a result, the V_{OUT} pin quickly returns to the V_{SS} level.
The current limit fold-back circuit operates as a short circuit protection and a current limiter function for the output pin.

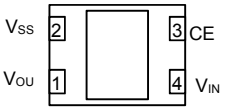
Features

Max. Output Current: 200mA
Operating Voltage Range: 1.4V ~ 6.0V (Absolute Max. Rating: 6.5V)
Output Voltage Range: 2.0V~5.0V (±1%) (*1)
1.2V~1.95V (±0.02V) (*1)
Dropout Voltage: 150mV@I_{OUT}=100mA, V_{OUT}=2.8V
Low Quiescent Current: 13μA@V_{OUT}=2.8V
Accuracy: ±1% (2.0V ~ 5.0V)
±20mV (1.2V ~ 1.95V)
Stand-by Current: Less than 0.1μA (CE Active High)
High Ripple Rejection: 50dB@f=1kHz,V_{OUT}=2.8V
Protection Circuits: Current limit (300mA, TYP.), Short Circuit Protection
Output capacitor is not required: Internal phase compensation
C_L High Speed Auto Discharge
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25, SSOT-24, USP-4, USPN-4, USP-3, WLP-4-01
Environmentally Friendly: EU RoHS Compliant, Pb Free
(*1) WLP-4-01 : 2.0V~5.0V (±2%), 1.2V~1.95V (±0.03V)

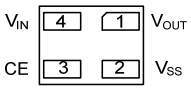
Pin Configuration



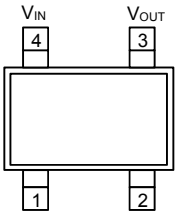
USP-3
(BOTTOM VIEW)



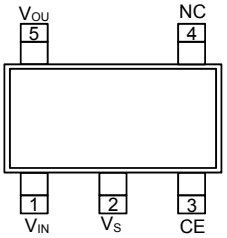
USP-4
(BOTTOM VIEW)



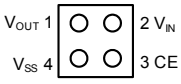
USPN-4
(BOTTOM VIEW)



SSOT-24
(TOP VIEW)

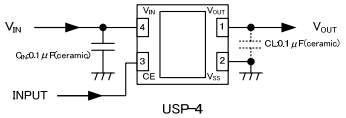


SOT-25
(TOP VIEW)

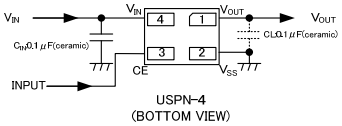


WLP-4-01
(BOTTOM VIEW)

Typical Application Circuits

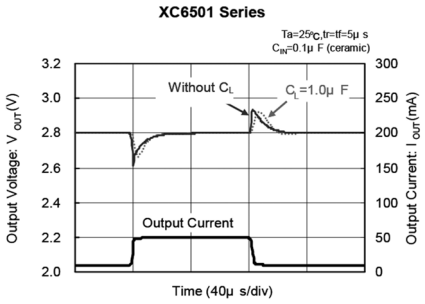


USP-4
(BOTTOM VIEW)
XC6501A/B/C/D Series



USPN-4
(BOTTOM VIEW)
XC6501A/B/C/D Series

Typical Performance Characteristics



Ordering Information

XC6501①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Regulator Type	A	Without CE Pull-down, Without C_L discharge
		B	Without CE Pull-down, With C_L discharge
		C	With CE Pull-down, Without C_L discharge
		D	With CE Pull-down, With C_L discharge
		P	3 pin, without CE pin (USP-3)
②③	Output Voltage	12 ~ 50	ex.)28V → ②=2, ③=8
④	Output Voltage Type [Accuracy]	1(*3)	0.1V increments ex.)1.80V → ②=1, ③=8, ④=1 [±0.02V @ 1.2V~1.9V, ±1% @ 2.0V~5.0V]
		A(*3)	0.05V increments ex.)1.85V → ②=1, ③=8, ④=A [±0.02V @ 1.25V~1.95V, ±1% @ 1.5V~4.95V]
		2(*4)	0.1V increments ex.)1.80V → ②=1, ③=8, ④=2 [±0.03V @ 1.2V~1.4V, ±2% @ 2.0V~5.0V]
		B(*4)	0.05V increments ex.)1.85V → ②=1, ③=8, ④=B [±0.03V @ 1.25V~1.45V, ±2% @ 1.55V~4.95V]
⑤⑥-⑦(*1)	Packages (Order Unit)	HR-G	USP-3 (Only XC6501P) (3,000pcs/Reel)(*2)
		GR-G	USP-4 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		7R-G	USPN-4 (5,000pcs/Reel)
		0R-G	WLP-4-01 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) USP-3 is available only for XC6501P series.
(*3) WLP-4-01 is excluded.
(*4) WLP-4-01 only.

XC6702 Series

36V Input 300mA Low Quiescent Current High Speed LDO Regulator

RoHS Halogen Antimony FREE

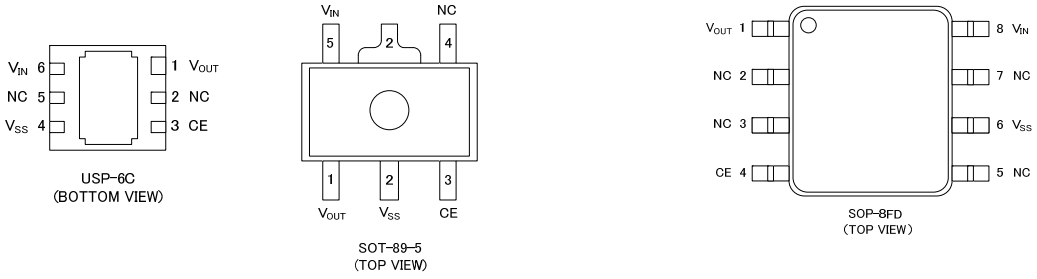
General Description

The XC6702 series are CMOS high-speed voltage regulator ICs with a 36 V input and low supply current.
Internal circuitry includes a reference voltage supply, error amplifier, driver transistor, over-current protection circuit, overheat protection circuit, soft start circuit, and phase compensation circuit.
The output voltage is fixed internally by laser trimming, and product selections from 1.8V to 18.0V are available.
The over-current protection circuit and overheat protection circuit are built-in, and when the output current reaches the current limit or the junction temperature reaches the temperature limit, the corresponding circuit activates.
The soft start circuit limits the rush current that flows from V_{IN} to V_{OUT} when the IC starts, enabling a stable startup sequence.
The IC is put in the standby state by inputting L level into the CE pin, and the supply current is reduced to 0.1 μA.
A low-ESR capacitor such as a ceramic capacitor can also be used for C_L.

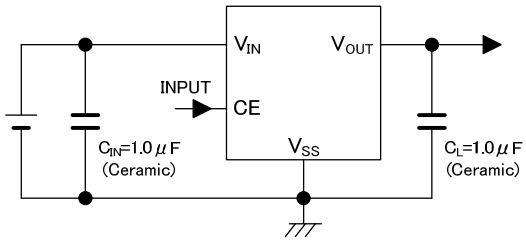
Features

Input Voltage:	4.5V～36.0V (Absolute Max. Rating 42.0V)
Peak Voltage:	46.0V (Transient≦400ms)
Output Current:	300mA
Output Voltage Range:	1.8V～18.0V (±1.0%)
Low Quiescent Current:	40 μA
Dropout Voltage:	350mV@I_{OUT}=100mA (V_{OUT}=5.0V)
High Ripple Rejection:	65dB@1kHz
Stand-by Current:	0.1 μA
Protection Circuit:	Current Limit Thermal Shutdown
Function:	Soft-start ON/OFF (Active High)
Output Capacitor:	Ceramic Capacitor Compatible (2.2 μF)
Operating Ambient Temperature:	-40℃～+105℃
Packages:	USP-6C, SOT-89-5, SOP-8FD
Environmentally Friendly:	EU RoHS Compliant, Pb Free

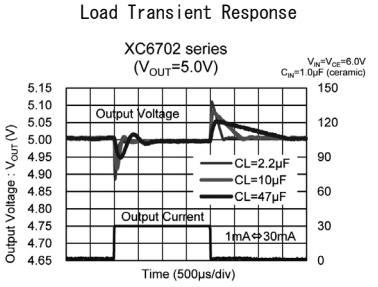
Pin Configuration



Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XC6702①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	D	Current Limiter Thermal Shutdown Soft-start ON/OFF Control
②③	Output Voltage (*2)	18～J0 (*3)	For the voltage within 1.8V～9.5V : e.g. 3.3V → ②=3, ③=3 5.0V → ②=5, ③=0
			For the voltage within 10.0V～18.0V : e.g. 10.0V → ②=A, ③=0 12.5V → ②=C, ③=5 18.0V → ②=J, ③=0
④	Output Voltage Accuracy	1	± 1.0%
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		QR-G	SOP-8FD (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) Output voltage setting steps are as follows:
V_{OUT} < 6.0V (0.1V increments)
V_{OUT} ≥ 6.0V (0.5V increments)
For other output voltage, please contact your local torex sales office or representative.
(*3) For 10.0V to 18.0V, A to J excluding I are used in "②"

XC6701 Series

28V Operation High Speed Voltage Regulators with Stand-by Function

RoHS Halogen Antimony FREE

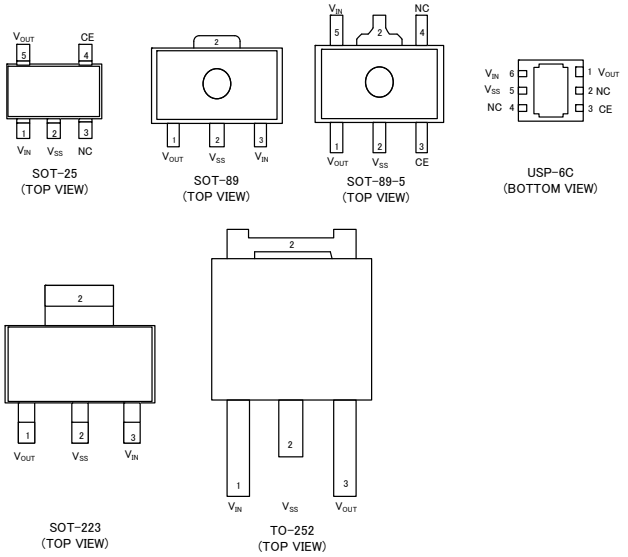
General Description

The XC6701 series are positive voltage regulator ICs manufactured using CMOS process with 28V of operation voltage. The series consists of a voltage reference, an error amplifier, a current limiter, a thermal shutdown circuit and a phase compensation circuit plus a driver transistor.
The output voltage is selectable in 0.1V increments within the range of 1.8V to 18V which fixed by laser trimming technologies. The output stabilization capacitor (CL) is also compatible with low ESR ceramic capacitors.
The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level.
The CE function can disable the output to be turned off and the IC becomes a stand-by mode resulting in greatly reduced power consumption. Packages are selectable depending on the applications from SOT-25, SOT-89, SOT-89-5, USP-6C, SOT-223, and TO-252.

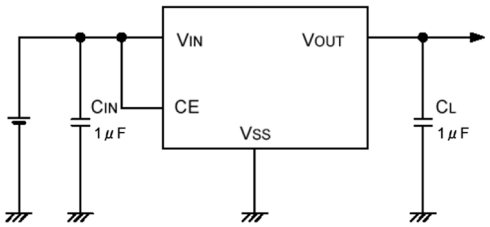
Features

Max. Output Current: 150mA (200mA limit)
(V_{IN}=V_{OUT}+3.0V)
Dropout Voltage: 300mV@I_{OUT}=20mA
Input Voltage Range: 2.0V ~ 28.0V (Absolute Max. Rating: 30.0V)
Output Voltage Range: 1.8V ~ 18.0V (0.1V increments)
Accuracy: ±2.0%
Low Quiescent Current: 50μA (V_{OUT}=5.0V)
Stand-by Current: Less than 0.1μA
High Ripple Rejection: 50dB@1kHz
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: -40°C ~+105°C (XC6701A)
-40°C ~+85°C (XC6701B,D)
Packages: SOT-25, SOT-89, SOT-89-5, USP-6C, SOT-223, TO-252
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

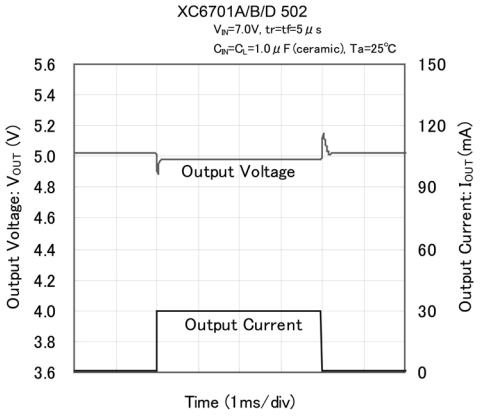


Typical Application Circuit



XC6701B Series
with CE function

Typical Performance Characteristics



Ordering Information

XC6701①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Fixed output voltage, Active H (Operating Ambient Temperature: -40℃≦Topr≦105℃)
		B	Fixed output voltage, Active H (Operating Ambient Temperature: -40℃≦Topr≦85℃)
		D	Fixed output voltage, with no CE function (Operating Ambient Temperature: -40℃≦Topr≦85℃)
②③	Output Voltage	18～J0	For the voltage within 1.8V～9.9V, that voltage. For 10V,11V,12V,13V,14V,15V,16V,17V, and 18Vblocks, A, B, C, D, E, F, G, H, and J are respectively used for "②". "②" and "③"are decimal voltage values. e.g.) 25 : 2.5V 50 : 5.0V B6 :11.6V F2 :15.2V J0 :18.0V
④	Output Voltage Accuracy	2	±2.0%
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel) (Type A/B Only)
		PR-G	SOT-89-5 (1,000pcs/Reel) (Type A/B Only)
		ER-G	USP-6C (3,000pcs/Reel) (Type A/B Only)
		FR-G	SOT-223 (1,000pcs/Reel) (Type D Only)
		JR-G	TO-252 (2,500pcs/Reel) (Type D Only)
		PR-G	SOT-89 (1,000pcs/Reel) (Type D Only)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6902 Series

-16V Input Three Terminal Negative High Speed Voltage Regulator

RoHS Halogen Antimony FREE

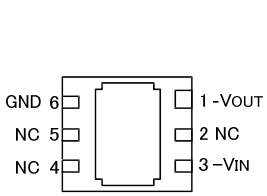
General Description

The XC6902 Series is a negative voltage CMOS regulator which includes a reference voltage source, error amplifiers, driver transistors, current limiters and phase compensators.
XC6902 is a 3 terminal negative voltage regulator (without CE pin) which is capable of accepting -16V input.
The over current protection circuit will operate when the output current reaches limit current. The thermal shutdown circuit will operate when the junction temperature reaches limit temperature.

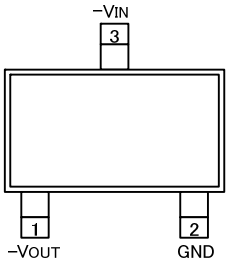
Features

Max. Output Current: 200mA
Input Voltage Range: -2.4 ~ -16V
(Absolute Max. Rating: -18.0V)
Output Voltage: -2.5V, -2.6V, -3.0V, -3.3V, -4.0V, -4.5V, -5.0V, -6.0V, -12.0V
Dropout Voltage: 400mV@I_{OUT}=100mA
Low Quiescent Current: 100μA
Accuracy: ±1.5% (-2.0V ~ -12V)
Temperature Stability: TYP. ±50ppm/℃
Protection Circuits: Current Limit 350mA TYP. Foldback
Thermal Shutdown (150℃)
Operating Ambient Temperature: -40℃~+85℃
Output Capacitor: Ceramic Capacitor Compatible
Packages: SOT-23, SOT-89, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

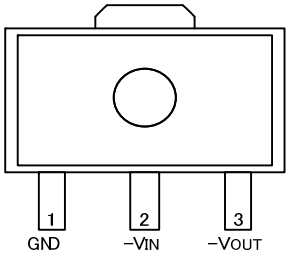
Pin Configuration



USP-6C
(BOTTOM VIEW)

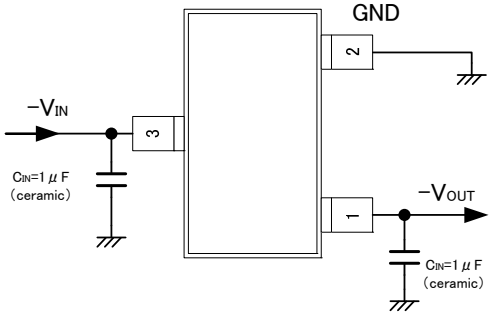


SOT-23
(TOP VIEW)



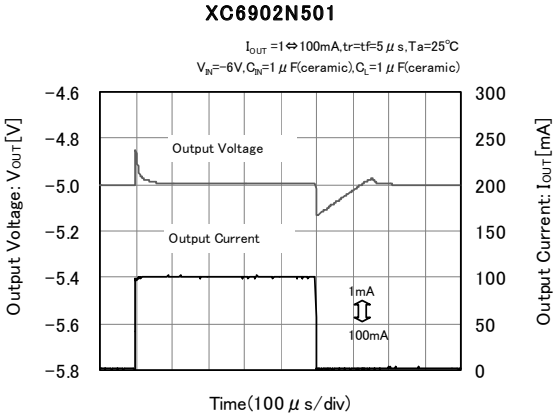
SOT-89
(TOP VIEW)

Typical Application Circuit



SOT-23
(TOP VIEW)

Typical Performance Characteristics



Ordering Information

XC6902①②③④⑤⑥-⑦ Three Terminal Voltage Regulator

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	N	Soft-start, Thermal Shutdown
②③④	Output Voltage(*2) (Accuracy)	251	-2.5V (±1.5%)
		261	-2.6V (±1.5%)
		301	-3.0V (±1.5%)
		331	-3.3V (±1.5%)
		401	-4.0V (±1.5%)
		451	-4.5V (±1.5%)
		501	-5.0V (±1.5%)
		601	-6.0V (±1.5%)
		C01	-12.0V (±1.5%)
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-23 (3,000pcs/Reel)
		PR-G	SOT-89 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For other output voltages, please contact your local Torex sales office or representative. The output voltage optional range is -0.9V to -12V.

XC6901 Series

200mA Negative Voltage High Speed Regulator with ON/OFF Control

RoHS Halogen Antimony FREE

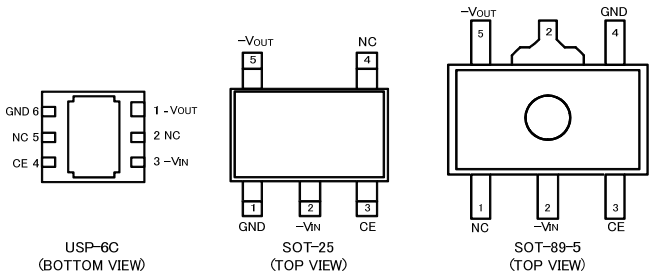
General Description

The XC6901 Series is a negative voltage CMOS regulator which includes a reference voltage source, error amplifier, driver transistor, current limiter and phase compensator.
The CE function enables the circuit to be in stand-by mode by inputting low level signal. In the stand-by mode, the electric charge at the output capacitor (C_L) will be discharged via the internal auto-discharge switch and as a result the $-V_{OUT}$ pin quickly returns to the V_{SS} level.
The over current protection circuit will operate when the output current reaches limit current. The thermal shutdown circuit will operate when the junction temperature reaches limit temperature.

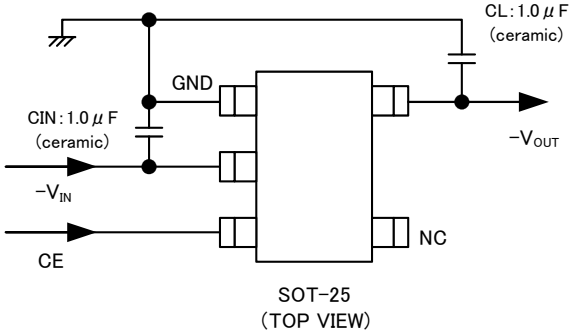
Features

Max. Output Current: 200mA
Input Voltage Range: -2.4V～-12.4V(V_{CE}＝3.6V)
(Absolute Max. Rating: -18V+V_{CE})
Output Voltage Range: -0.9V～-12.0V
Dropout Voltage: 400mV@I_{OUT}=100mA
Low Quiescent Current: 100μA
Output Voltage Accuracy: ±1.5% (V_{OUT}＜-2.0V)
±0.03V ($-V_{OUT}$≧-2.0V)
Temperature Stability: TYP.±50ppm/℃
CE High Level Voltage: +1.2V, Active High
Stand-by Current: 0.1μA
Protection Circuits: Current Limit 350mA TYP, Foldback
Overheat Protection T_{TSB}=150℃
Function: C_L High-speed Discharge
Output Capacitor: Ceramic Capacitor Compatible
Operating Ambient Temperature: -40℃~+85℃
Packages: SOT-25, SOT-89-5, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

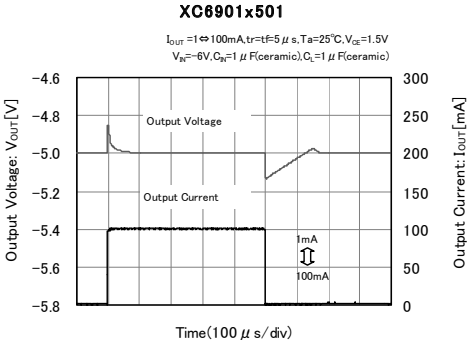
Pin Configuration



Typical Application Circuits



Typical Performance Characteristics



Ordering Information

XC6901①②③④⑤⑥-⑦ ON/OFF Control Voltage Regulator (CE Active High)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type (*2)	D	CE Pull-down resistor C_L Auto-discharge
②③	Output Voltage	09～C0	-0.9V~-12V e.g. -0.9V→②=0, ③=9, -12V→②=C, ③=0 A : 10, B : 11, C : 12
④	Output Type	1	0.10V Increments e.g. -1.2V→②=1, ③=2, ④=1
		B	0.05V Increments for -0.95V~-4.95V e.g. -1.25V→②=1, ③=2, ④=B
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For the type without C_L auto-discharge, please contact your local Torex sales office or representative.

STANDARD VOLTAGE
● Examples for standard voltage

V_{OUT} (V)	PACKAGES		
	USP-6C	SOT-25	SOT-89-5
-1.2V	XC6901D121ER-G	XC6901D121MR-G	XC6901D121PR-G
-2.5V	XC6901D251ER-G	XC6901D251MR-G	XC6901D251PR-G
-2.6V	XC6901D261ER-G	XC6901D261MR-G	XC6901D261PR-G
-3.0V	XC6901D301ER-G	XC6901D301MR-G	XC6901D301PR-G
-3.3V	XC6901D331ER-G	XC6901D331MR-G	XC6901D331PR-G
-4.0V	XC6901D401ER-G	XC6901D401MR-G	XC6901D401PR-G
-4.5V	XC6901D451ER-G	XC6901D451MR-G	XC6901D451PR-G
-5.0V	XC6901D501ER-G	XC6901D501MR-G	XC6901D501PR-G
-6.0V	XC6901D601ER-G	XC6901D601MR-G	XC6901D601PR-G
-12.0V	XC6901DC01ER-G	XC6901DC01MR-G	XC6901DC01PR-G

XB1085 Series

3.0A Positive Voltage Regulator

RoHS Compliant, Halogen Antimony FREE

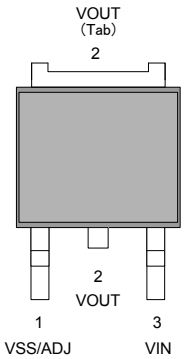
General Description

The XB1085 is a series of low dropout positive voltage regulators with a high output current capacity of 3.0A .
Stable output can be maintained by using 10μF (C_{IN}) and 22μF (C_L) of tantalum capacitors.
The fixed voltage types (XB1085P series) are available in 1.5V, 1.8V, 2.5V, 3.3V, and 5.0V. The voltage adjustable type (XB1085K series) is also available which can set the output voltage with only two external resistors.
With an overcurrent and thermal protection circuit built-in, the IC is disabled for protection when an output current reaches limit current or junction temperature increases up to limit temperature.
The XB1085 series is available in TO-252 package.

Features

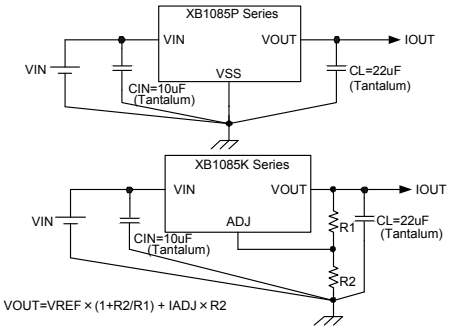
Max. Output Current: More than 3.0A (within Pd)
Max. Operating Voltage: 12.0V
(Absolute Max. Rating: 18.0V)
Output Voltage: 1.5V, 1.8V, 2.5V, 3.3V, 5.0V, (XB1085P)
Externally Set
(XB1085K/ Reference Voltage 1.25V (TYP.))
Output Voltage Accuracy: ±1.0% (Tj =25℃)
Dropout Voltage: 1.3V @ I_{OUT}=3.0A (TYP.)
Line Regulation: 0.015% (TYP.) <ADJ>
Load Regulation: 0.1% (TYP.) <ADJ>
Reference Voltage Pin Current: Less than 120μA <ADJ>
Overcurrent Protection Circuit Built-in
Thermal Protection Circuit Built-in
Operating Ambient Temperature: ~ +85°C
Package: TO-252
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

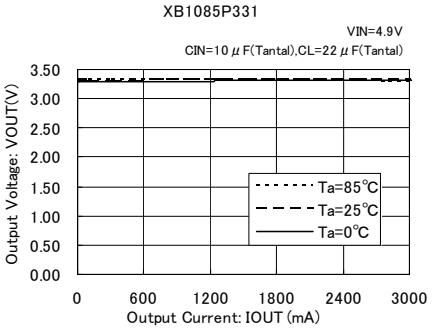


TO-252
(TOP VIEW)

Typical Application Circuits



Typical Performance Characteristics



Ordering Information

XB1085①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYNBOL	DESCRIPTION
①	Type of Regulators	P	Fixed V_{OUT}
		K	Adjustable (Externally Set)
②③④	Output Voltage (Output Voltage Accuracy)	151	V_{OUT}=1.5V (±1.0%)
		181	V_{OUT}=1.8V (±1.0%)
		251	V_{OUT}=2.5V (±1.0%)
		331	V_{OUT}=3.3V (±1.0%)
		501	V_{OUT}=5.0V (±1.0%)
	Output Voltage Externally Set (Output Voltage Accuracy)	12B	ADJ, V_{OUT}=1.25V (±1.0%)
⑤⑥-⑦(*1)	Package (Order Unit)	JR-G	TO-252 (2,500pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6413/XC6414 Series

10V, 300mA/500mA High Speed LDO Regulators with Voltage Detector

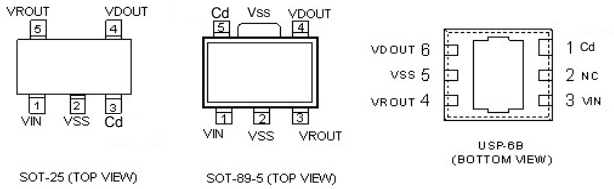
General Description

The XC6413/XC6414 series are highly precise, low noise, positive voltage LDO regulators with voltage detector manufactured using CMOS processes. Performance features of the series includes high ripple rejection and low dropout and the series features a voltage reference, an error amplifier, a current limiter and a phase compensation circuit plus a driver transistor. Detect voltage is selectable in 0.1V increments within a range of 0.9V ~ 6.0V and VR output voltage is selectable within a range of 0.9V~5.5V.
The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.
The current limiter's foldback circuit operates as a short-circuit protection as well as the output current limiter for the output pin. The series provides optional user selection from a variety of circuit applications, such as detector monitoring, detector output logic and internal pull-up / down resistance.
The XC6413/XC6414FY types can delay the detector output. Delay time can be controlled by the use of an external capacitor (semi-custom).

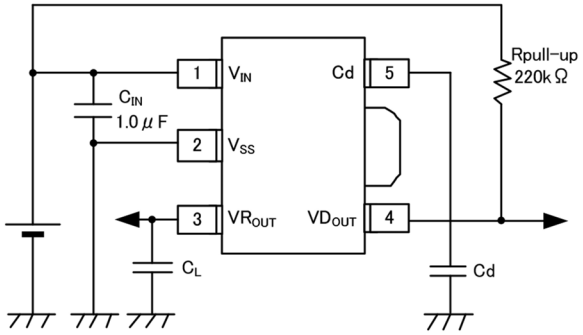
Features

Max. Output Current:	300mA (380mA limit) (1.8V≤VROUT≤5.5V)[XC6413] 500mA (600mA limit) (2.5V≤VROUT≤5.5V)[XC6414]
Operating Voltage Range:	2.0V ~ 10.0V (Absolute Max. Rating: 12.0V)
VR Setting Output Voltage:	0.9V ~ 5.5V (0.1V increments)
Dropout Voltage:	200mV (IROUT=100mA)
Low Quiescent Current:	35μA (TYP.)
VD Detect Voltage Setting:	0.9V ~ 6.0V (0.1V increments)
When Monitoring VIN:	more than 2.0V
VR Setting Voltage Accuracy:	± 2.0%
VD Detect Voltage Accuracy:	± 2.0%
VR.VD Temperature Coefficient:	± 100ppm/℃ (TYP.)
High Ripple Rejection:	65dB (10kHz)
Output Capacitor:	Low ESR Ceramic
Operating Ambient Temperature:	- 40℃ ~ + 85℃
Packages:	SOT-25, USP-6B, SOT-89-5
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



Typical Application Circuits



Ordering Information

XC6413 / XC6414①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Operational Function	F	Cd pin
②	Type of Regulator	Y	VD Sense pin : VROUT, VD Output Logic : Detect L
③④	Output Voltage & Detect Voltage	-	Internally set sequential number relating to output voltage and detect voltage (refer to the chart PIN NUMBER: ③④ Table) VR setting output voltage range: 0.9V ~ 5.5V Detect voltage setting range: 0.9V ~ 6.0V 100mV increments are available
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel))

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

PIN NUMBER: ③, ④ Types (80 ~ 99 : Standard voltage products)

③④	VROUT	VDOUT	③④	VROUT	VDOUT	③④	VROUT	VDOUT	③④	VROUT	VDOUT
01			11			80	1.8	1.6	90	1.3	2.0
02			12			81	2.8	3.1	91	1.5	2.0
03			13			82	1.8	2.0	92		
04			14			83	2.5	2.8	93		
05			15			84	2.85	3.2	94		
06			16			85	3.0	3.3	95		
07			17			86	3.5	3.8	96		
08			18			87	3.0	4.2	97		
09			19			88	3.3	4.0	98		
10			20			89			99		

For other voltage, please contact your local Torex sales office or representative.

XC6408 Series

28V Operation Voltage Regulator with Voltage Detector

RoHS
Halogen Antimony FREE

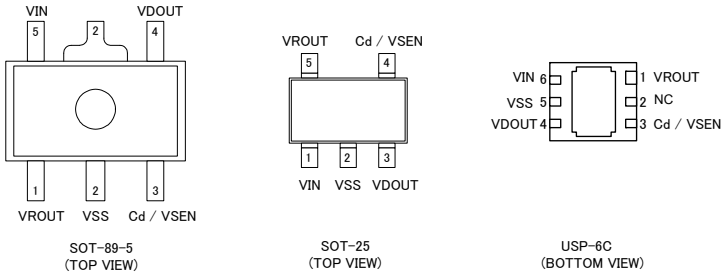
General Description

The XC6408 series is a positive voltage regulator IC manufactured using CMOS process with 28V operation voltage. The series consists of a voltage reference, an error amplifier, a current limiter, a thermal shutdown circuit and a phase compensation circuit plus a driver transistor. The output voltage and the detect voltage are user selectable in 0.1V increments. The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level. The XC6408D series monitors its output voltage and provides reset signal if its output voltage falls below the pre-set voltage. This reset time (release delay time) can be set by an external capacitor. The XC6408E series monitors an external power supply and enables the output to be turned off and the IC becomes a stand-by mode.

Features

Max. Output Current: 150mA (V_{IN}=V_{ROUT}+3.0V)
Input Voltage Range: 2.0V ~ 28.0V (Absolute Max. Rating: 30V)
Output Voltage Range: 2.0V ~ 18.0V (0.1V increments)
Dropout Voltage: 175mV@I_{OUT}=20mA (V_{ROUT}=12V)
Low Quiescent Current: XC6408D 9.5μA (TYP.) (V_{ROUT}=12V, V_{DF}=11V)
XC6408E 8μA (TYP.) (V_{ROUT}=12V, V_{DF}=11V)
Detect Voltage Range: 2.0V ~ 16.0V (0.1V increments)
High Accuracy (Regulator): ±2.0%
(Detector): ±2.5%
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-89-5, SOT-25, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

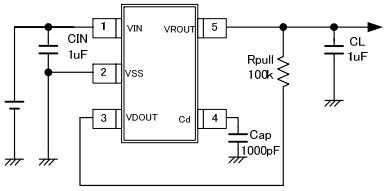


SOT-89-5 (TOP VIEW)

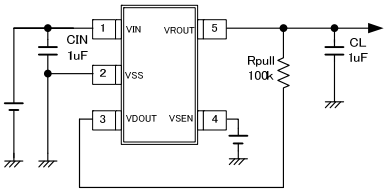
SOT-25 (TOP VIEW)

USP-6C (BOTTOM VIEW)

Typical Application Circuits



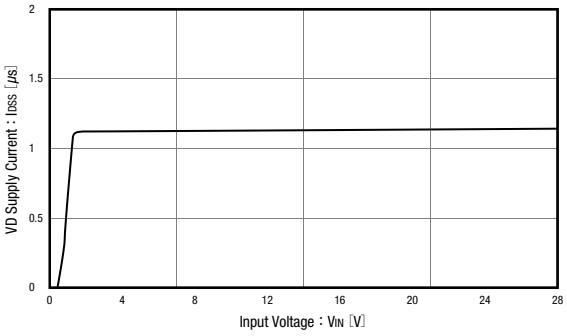
XC6408D



XC6408E

Typical Performance Characteristics

XC6408E(V_{DF}=4.5V)



Ordering Information

XC6408D Series: V_{ROUT} pin voltage detection, release delay capacitor
XC6408E Series: V_{SEN} pin for external voltage detection, auto power ON/OFF function

XC6408D①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	V_{DOUT} Output Configuration	N	Open Drain
②③	Output Voltage Detect Voltage	-	See DESIGNATOR②③ Table
④⑤-⑥(*1)	Packages(Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)

VD logic operates as detect low output and release high output.
(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

DESIGNATOR②③ (No. 01 ~ 20 is standard voltage)

②③	V_{ROUT}	V_{DF}	②③	V_{ROUT}	V_{DF}
01	2.50	2.10	**11**	–	–
02	3.00	2.50	**12**	–	–
03	3.30	2.70	**13**	–	–
04	3.30	2.80	**14**	–	–
05	5.00	4.10	**15**	–	–
06	5.00	4.20	**16**	–	–
07	8.00	6.80	**17**	–	–
08	9.00	5.00	**18**	–	–
09	9.00	7.50	**19**	–	–
10	12.00	10.00	**20**	–	–

For other voltage, please contact your local Torex sales office or representative.

XC6408E①②③④⑤-⑥

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	V_{DOUT} Output Configuration	N	Open Drain
②③	Output Voltage Detect Voltage	-	See DESIGNATOR②③ Table
④⑤-⑥(*1)	Packages (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)

VD logic operates as detect low output and release high output.
(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

DESIGNATOR②③ (No. 01 ~ 20 is standard voltage)

②③	V_{ROUT}	V_{DF}	②③	V_{ROUT}	V_{DF}
01	2.50	2.10	**11**	2.50	2.70
02	3.00	2.50	**12**	2.50	2.80
03	3.30	2.70	**13**	3.00	4.10
04	3.30	2.80	**14**	3.00	4.20
05	5.00	4.10	**15**	3.30	4.10
06	5.00	4.20	**16**	3.30	4.20
07	8.00	6.80	**17**	5.00	5.60
08	9.00	5.00	**18**	5.00	6.80
09	9.00	7.50	**19**	9.00	10.00
10	12.00	10.00	**20**	12.00	15.00

For other voltage, please contact your local Torex sales office or representative.

XC6405 Series

500mA High Speed LDO Regulators, Voltage Detector Function

RoHS Compliant, Halogen & Antimony FREE

General Description

The XC6405 series are precise, low noise, high speed, high current, positive voltage low dropout regulators with built-in voltage detector. They are fabricated using Torex's CMOS process. Performance features of the series includes high ripple rejection and low dropout voltage, and the series features a voltage reference, an error amplifier, a current limiter and a phase compensation circuit plus a driver transistor.

Detect voltage is selectable in 100mV increments within the range of 0.9V to 5.5V and the LDO output voltage is selectable within a range of 0.9V to 5.1V, also in 0.1V increments.

The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.

The current limiter's foldback circuit also operates as a short circuit protection for the output current limiter and the output pin.

The series provides options to the user to select from a variety of circuit features, such as detector monitoring, detector output logic, CE and EN pin input logic, internal pull-up / down resistance, and power ready.

The IC's internal regulator circuit can be placed in stand-by mode via the EN function (XC6405 A to C series). The whole IC can be put in to stand-by mode via the CE function with the XC6405D series (semi-custom). In the stand-by mode, power consumption is greatly reduced.

The XC6405 A and B series features the toggle operation function. The regulator output can be OFF when the XC6405B series detects voltage (semi-custom).

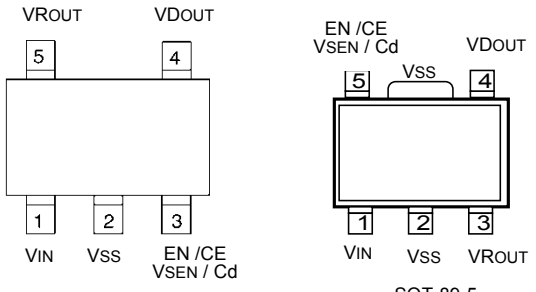
The XC6405E series can monitor another power source by using the VSEN pin (semi-custom).

The XC6405F series can delay the detector output the delay time can be controlled by the use of an external capacitor (semi-custom).

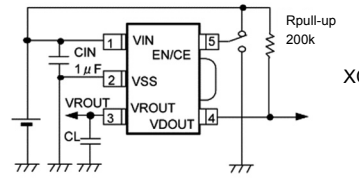
Features

Max. Output Current:	More than 500mA (600mA limit) (2.5V≦VROUT≦4.9V)
Operating Voltage Range:	2.0V ~ 6.0V
VR Setting Output Voltage Range:	0.9V~5.1V (0.1V increments ± 2.0%)
Dropout Voltage:	200mV (IROUT=100mA)
Low Quiescent Current:	90μA (TYP.)
Detect Voltage Setting Range:	0.9V ~ 5.5V (0.1V increments ± 2.0%)
VR. VD Temperature Coefficient:	±100ppm/°C (TYP.)
High Ripple Rejection:	65dB (10kHz)
Output Capacitor:	Low ESR Ceramic
Operating Ambient Temperature:	- 40℃ ~ + 85℃
Packages:	SOT-25, SOT-89-5
Environmentally Friendly:	EU RoHS Compliant, Pb Free

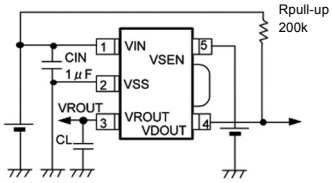
Pin Configuration



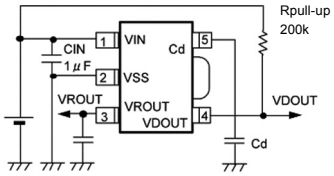
Typical Application Circuits



XC6405A ~ D Series



XC6405E Series



XC6405F Series

Ordering Information

XC6405①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Operational Function	A	Toggle and EN function(*2)
		B	Toggle, EN function, VD signal/VR OFF function(*2)
		C	EN function(*2)
		D	CE function(*2)
		E	VSEN Pin(*2)
		F	Cd pin
②	Type of Regulator	A~Z	As in the chart below.
③④	Output Voltage & Detect Voltage	01~	Internally set sequential number relating to output voltage and detect voltage (refer to the chart below) VR setting output voltage range: 0.9V~5.1V Detect voltage setting range: 0.9V ~5.5V 0.1V increments are available
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		DR-G	Embossed tape, Standard feed

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

(*2) For A ~ E series, please contact your local Torex sales office or representative.

PIN NUMBER : ②Types

②	EN / CE FUNCTION	EN / CE LOGIC	PULL UP/DOWN RESISTANCE	VD SENSE PIN	VD OUTPUT LOGIC	PIN NUMBER ①
A	Functional	Active High	Pull-down Function	VIN	Detect L	A ~ D Series
B	Functional	Active High	Pull-down Function	VIN	Detect H	
C	Functional	Active High	Pull-down Function	VOUT	Detect L	
D	Functional	Active High	Pull-down Function	VOUT	Detect H	
E	Functional	Active High	Nonfunctional	VIN	Detect L	
F	Functional	Active High	Nonfunctional	VIN	Detect H	
H	Functional	Active High	Nonfunctional	VOUT	Detect L	
K	Functional	Active High	Nonfunctional	VOUT	Detect H	
L	Functional	Active Low	Pull-up Function	VIN	Detect L	
M	Functional	Active Low	Pull-up Function	VIN	Detect H	
N	Functional	Active Low	Pull-up Function	VOUT	Detect L	
P	Functional	Active Low	Pull-up Function	VOUT	Detect H	
R	Functional	Active Low	Nonfunctional	VIN	Detect L	
S	Functional	Active Low	Nonfunctional	VIN	Detect H	
T	Functional	Active Low	Nonfunctional	VOUT	Detect L	
U	Functional	Active Low	Nonfunctional	VOUT	Detect H	
V	Nonfunctional	-	-	VIN / VSEN	Detect L	E & F Series
X	Nonfunctional	-	-	VIN / VSEN	Detect H	
Y	Nonfunctional	-	-	VOUT	Detect L	F Series
Z	Nonfunctional	-	-	VOUT	Detect H	

XC6403/XC6404 Series

300mA/500mA High Speed LDO Regulators, Voltage Detector Function

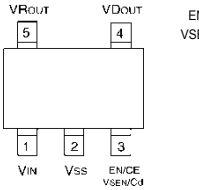
General Description

The XC6403/XC6404 series are highly precise, low noise, positive voltage low dropout regulators with built-in voltage detector. They are fabricated using Torex's CMOS process. Performance features of the series includes high ripple rejection and low dropout voltage, and the series features a voltage reference, an error amplifier, a current limiter and a phase compensation circuit plus a driver transistor.
Detect voltage is selectable in 0.1V increments within the range of 0.9V to 5.5V and the LDO output voltage is selectable within a range of 0.9V to 5.6V (XC6403) and 0.9V to 5.1V (XC6404), also in 100mV increments.
The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.
The current limiter's foldback circuit also operates as a short circuit protection for the output current limiter and the output pin.
The series provides options to the user to select from a variety of circuit features, such as detector monitoring, detector output logic, CE and EN pin input logic, and internal pull-up / down resistance.
The IC's internal regulator circuit can be placed in stand-by mode via the EN function (XC6403/04 A to C series). The whole IC can be put in to stand-by mode via the CE function with the XC6403/04D series (semi-custom). In the stand-by mode, power consumption is greatly reduced.
The XC6403/04 A and B series features the toggle operation function. The regulator output can be OFF when the XC6403/04B series detects voltage (semi-custom).
The XC6403/04E series can monitor another power source by using the VSEN pin (semi-custom).
The XC6403/04F series can delay the detector output: the delay time can be controlled by the use of an external capacitor (semi-custom).

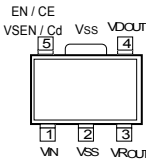
Features

Max. Output Current: 300mA (380mA limit)
(1.8V≤VROUT≤5.3V) [XC6403]
500mA (600mA limit)
(2.5V≤VROUT<4.9V) [XC6404]
Max. Operating Voltage: 2.0V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Dropout Voltage: 200mV (IOUT=100mA)
Low Quiescent Current: 35μA (TYP.)
VR Setting Output Voltage:
[XC6403] 0.9V~ 5.6V (0.1V increments, ± 2.0%)
[XC6404] 0.9V~ 5.1V (0.1V increments, ± 2.0%)
Detect Voltage Setting: 0.9V ~ 5.5V
When monitoring VIN: More than 2.0V
VR. VD Temperature Coefficient: ±100ppm/℃ (TYP.)
High Ripple Rejection: 65dB (10kHz)
Output Capacitor: Low ESR Ceramic
Operating Ambient Temperature: - 40 ~ + 85℃
Packages: SOT-25, SOT-89-5, USP-6B
Environmentally Friendly: EU RoHS Compliant, Pb Free

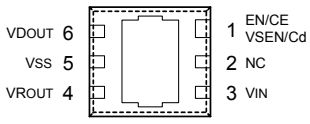
Pin Configuration



SOT-25
(TOP VIEW)

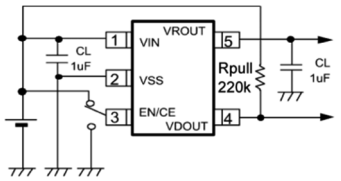


SOT-89-5
(TOP VIEW)

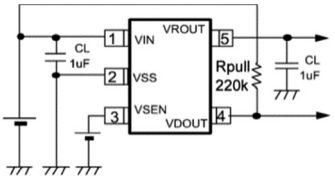


USP-6B
(BOTTOM VIEW)

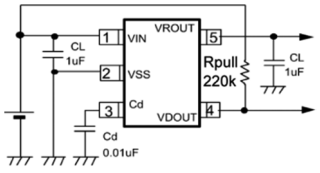
Typical Application Circuits



XC6403A ~ D Series



XC6403E Series



XC6403F Series

Ordering Information

XC6403/XC6404①②③④⑤⑥-⑦

DESINATOR	ITEM	SYMBOL	DESCRIPTION
①	Operational Function	A	Toggle and EN function(*2)
		B	Toggle, EN function, VD signal/VR OFF function(*2)
		C	EN function
		D	CE function
		E	VSEN Pin
		F	Cd pin
②	Type of Regulator	A~Z	As in the chart below.
③④	Output Voltage & Detect Voltage	01~	Internally set sequential number relating to output voltage and detect voltage (refer to the chart below) VR setting output voltage range: 0.9V~5.6V[XC6403] 0.9V~5.1V[XC6404] Detect voltage setting range: 0.9V ~5.5V 0.1V increments are available
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For A and B series, please contact your local Torex sales office or representative.

PIN NUMBER : ②Types

②	EN / CE FUNCTION	EN / CE LOGIC	PULL UP/DOWN RESISTANCE	VD SENSE PIN	VD OUTPUT LOGIC	PIN NUBER ①
A	Functional	Active High	Pull-down Function	VIN	Detect L	A ~ D Series
B	Functional	Active High	Pull-down Function	VIN	Detect H	
C	Functional	Active High	Pull-down Function	VOUT	Detect L	
D	Functional	Active High	Pull-down Function	VOUT	Detect H	
E	Functional	Active High	Nonfunctional	VIN	Detect L	
F	Functional	Active High	Nonfunctional	VIN	Detect H	
H	Functional	Active High	Nonfunctional	VOUT	Detect L	
K	Functional	Active High	Nonfunctional	VOUT	Detect H	
L	Functional	Active Low	Pull-up Function	VIN	Detect L	
M	Functional	Active Low	Pull-up Function	VIN	Detect H	
N	Functional	Active Low	Pull-up Function	VOUT	Detect L	
P	Functional	Active Low	Pull-up Function	VOUT	Detect H	
R	Functional	Active Low	Nonfunctional	VIN	Detect L	
S	Functional	Active Low	Nonfunctional	VIN	Detect H	
T	Functional	Active Low	Nonfunctional	VOUT	Detect L	
U	Functional	Active Low	Nonfunctional	VOUT	Detect H	
V	Nonfunctional	-	-	VIN / VSEN	Detect L	E & F Series
X	Nonfunctional	-	-	VIN / VSEN	Detect H	
Y	Nonfunctional	-	-	VOUT / VSEN	Detect L	F Series
Z	Nonfunctional	-	-	VOUT / VSEN	Detect H	

XC6402 Series

700mA High Speed LDO Regulators, Voltage Detector Function

RoHS Compliant, Halogen Antimony FREE

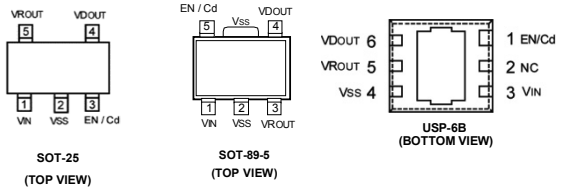
General Description

The XC6402 series are precise, low noise, high current, positive voltage low dropout regulators with built-in voltage detector. They are fabricated using Torex's CMOS process. The series features a voltage reference, an error amplifier, a current limiter, a voltage detector and a phase compensation circuit plus a driver transistor.
The output voltage of the LDO and detect voltage of the detector is selectable in 0.05V increments with in the range of 0.8V to 5.0V.
With a low ON resistance driver transistor built-in, batteries can be used until input-output voltage differential is minimal and can accordingly be used for a longer time.
The series is also compatible with low ESR ceramic capacitors which give added output stability.
The series provides options to the user to select from a variety of circuit features, such as detector monitoring, detector output logic, EN pin input logic, and internal pull-up / down resistance (semi-custom).
The IC's internal regulator circuit can be placed in stand-by mode via the EN function (XC6402C series). In the stand-by mode, power consumption is greatly reduced.
The XC6402F series can delay the detector output: the delay time can be controlled by the use of an external capacitor.

Features

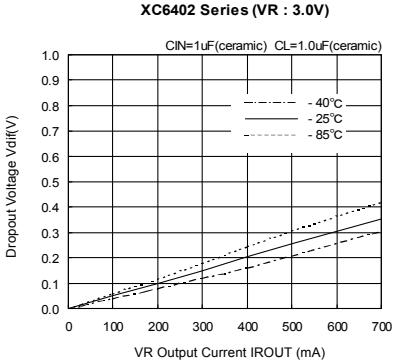
Max. Output Current:	700mA (800mA limit) (1.6V≦VROUT≦5.0V)
Max. Operating Voltage:	1.5V ~ 6.0V (Absolute Max. Rating: 6.5V)
VR Output Voltage Range:	0.8V ~ 5.0V (0.05V increments)
VD Output Voltage Range:	0.8V ~ 5.0V (0.05V increments)
Dropout Voltage:	50mV (IOUT=100mA)
Low Quiescent Current:	35μA(TYP)
When monitoring V_{IN}:	More than 1.5V
Accuracy:	±2.0%
High Ripple Rejection:	60dB (@1kHz)
Operating Ambient Temperature:	- 40 ~ +85℃
Output Capacitor:	Low ESR Ceramic
Packages:	SOT-25, SOT-89-5, USP-6B
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



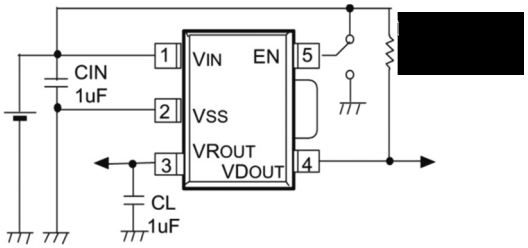
Typical Performance Characteristics

Dropout Voltage vs. VR Output Current

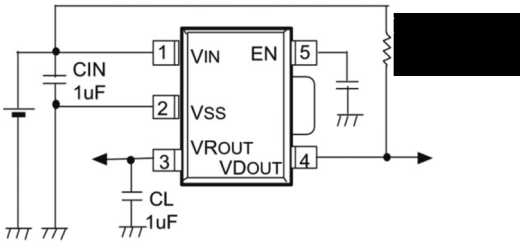


Typical Application Circuits

●XC6402C Series



●XC6402F Series



Ordering Information

XC6402①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Operational Function	C	EN function
		F	Cd pin
②	Type of Regulator	A~Z	As in the chart below
③④	Output Voltage & Detect Voltage	01~	Internally set sequential number relating to output voltage and detect voltage VR setting output voltage range: 0.8V~5.0V Detect voltage setting range: 0.8V ~5.0V 0.05V increments are available
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-G	SOT-25 (3,000pcs/Reel)
		PR-G	SOT-89-5 (1,000pcs/Reel)
		DR-G	USP-6B (3,000pcs/Reel)

PIN NUMBER : ②Types

②	EN FUNCTION	EN LOGIC	PULL UP/DOWN RESISTANCE	VD SENSE PIN	VD OUTPUT LOGIC	PIN NUMBER ①
A	Functional	Active High	Pull-down Function	VIN	Detect L	C Series
B	Functional	Active High	Pull-down Function	VIN	Detect H	
C	Functional	Active High	Pull-down Function	VROUT	Detect L	
D	Functional	Active High	Pull-down Function	VROUT	Detect H	
E	Functional	Active High	Nonfunctional	VIN	Detect L	
F	Functional	Active High	Nonfunctional	VIN	Detect H	
H	Functional	Active High	Nonfunctional	VROUT	Detect L	
K	Functional	Active High	Nonfunctional	VROUT	Detect H	
L	Functional	Active Low	Pull-up Function	VIN	Detect L	
M	Functional	Active Low	Pull-up Function	VIN	Detect H	
N	Functional	Active Low	Pull-up Function	VROUT	Detect L	
P	Functional	Active Low	Pull-up Function	VROUT	Detect H	
R	Functional	Active Low	Nonfunctional	VIN	Detect L	
S	Functional	Active Low	Nonfunctional	VIN	Detect H	
T	Functional	Active Low	Nonfunctional	VROUT	Detect L	
U	Functional	Active Low	Nonfunctional	VROUT	Detect H	
V	Nonfunctional	-	-	VIN	Detect L	F Series
X	Nonfunctional	-	-	VIN	Detect H	
Y	Nonfunctional	-	-	VROUT	Detect L	
Z	Nonfunctional	-	-	VROUT	Detect H	

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XCM414 Series

Voltage Regulator with Bridge Diode for Wireless Power Receiver

RoHS Halogen Antimony FREE

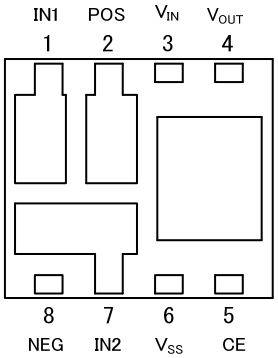
General Description

The XCM414 series consist of four Schottky Barrier Diodes (SBD) and a positive voltage regulator (VR).
These four SBDs configure a bridge circuit and it performs the full-wave rectification of an AC input so that the positive voltage regulator can generate DC output.
The VR consists of a voltage reference, an error amplifier, a current limiter, a thermal shutdown circuit and a phase compensation circuit plus a driver transistor. The output voltage is preset at 3.3V in the IC as a standard value, and it is selectable in 0.1V increments within the range of 2.0V to 12V using laser trimming technologies. The output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors.
The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level.
The CE function enables the output to be turned off and the IC becomes a stand-by mode resulting in greatly reduced power consumption.

Features

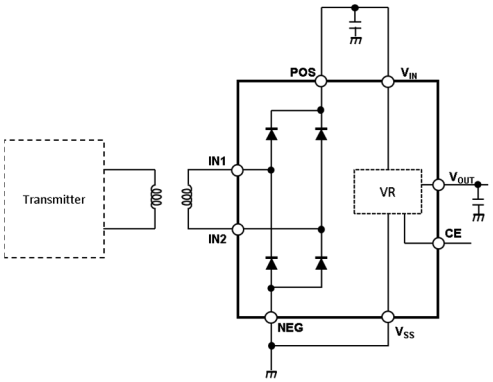
【Schottky Barrier Diode (SBD)】
Forward Voltage: 0.33V (IF=10mA)
Reverse Current: 2μA (VR=40V)
【Voltage Regulator (VR)】
Input Voltage Range: 2.0V～26.0V
Output Voltage (nominal): 3.3V
Output Voltage Range (option): 2.0V～12.0V(0.1V increments)
Fixed Output Accuracy: ±2%
Low Power Consumption: 5μA
Stand-by Current: less than 0.1μA
High Ripple Rejection: 30dB@1kHz
Low ESR Capacitor: Ceramic Capacitor Compatible
Built-in Protection: Current Limit Circuit
: Thermal Shutdown Circuit
Operating Temperature: -40℃～+85℃
Package: USP-8B10
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



USP-8B10
(BOTTOM VIEW)

Typical Application Circuit



Ordering Information

XCM414①②③④⑤⑥-⑦

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	TYPE	B	Fixed
②③④	Output Voltage	020～120	For the voltage within 2.0V ~9.9V (0.1V increments) (*2) e.g. 033 ⇒ 3.3V、 105 ⇒ 10.5V
⑤⑥-⑦(*1)	Package (Order Unit)	D2-G	USP-8B10 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) Standard: XCM414B033D2-G.

XC8109 Series

85mΩ High Function Power Switch with Current Limit Adjustable Pin (0.075A～1.3A Current Limit Adjustable)

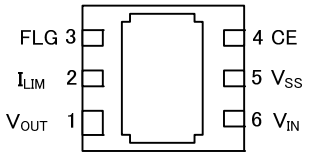
General Description

The XC8109 series is a P-channel MOSFET power switch IC with a low ON resistance. A current limit, reverse current protection (prevents reverse current from V_{OUT} to V_{IN}), soft start, thermal shutdown, and an under voltage lockout (UVLO) are incorporated as protective functions. A flag function monitors the power switch status. The flag output has N-channel open drain structure, and outputs Low level signal while over-current or overheating is detected, or while the reverse current protection is operated.
A variable current limiting function is integrated, allowing the current limit value to be set, using an external resistor.
The voltage level which is fed to CE pin determines the status of XC8109. The logic level of CE pin is selectable between either one of active high or active low.

Features

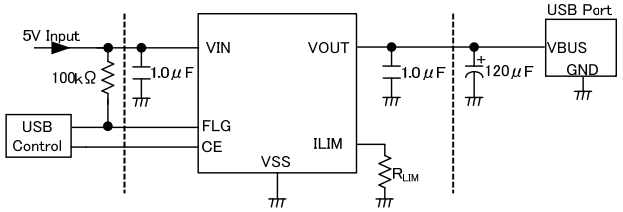
Input Voltage Range: 2.5V～5.5V (Absolute Max. Rating: 6.0V)
Max. Output Current: 0.9A
ON Resistance: 85mΩ@V_{IN}=5.0V (TYP.)
Quiescent Current: 40μA@ V_{IN}=5.0V
Stand-by Current: 0.1μA (TYP.)
Flag Delay Time: 7.5ms (TYP.) * At over-current detection
4ms (TYP.) * At reverse voltage detection
Protection Circuit: Reverse Current Protection 0.075A～1.3A(TYP.)
Thermal Shutdown
Under Voltage Lockout (UVLO)
Soft-start
Functions: Flag Output
CE Pin Input Logic Selectable
Current Limit Response Time: 2μs (TYP.) * Reference value
Operating Ambient Temperature: -40℃～+105℃
Package: USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



USP-6C
(BOTTOM VIEW)

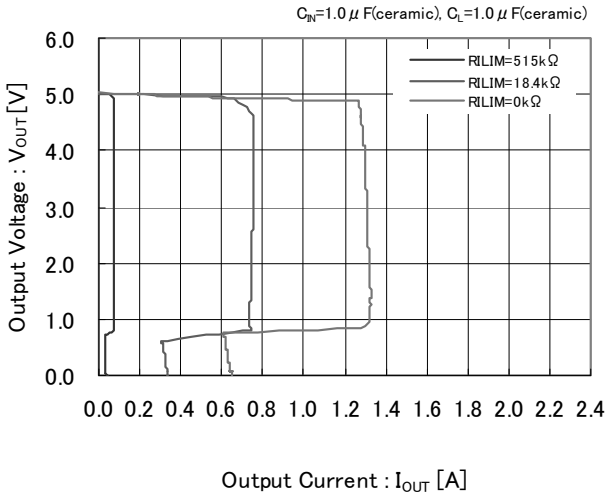
Typical Application Circuit



* The Typical circuit is base on USB high side switch.
The XC8109 series can accommodate 1μF output capacitor (C_L).

Typical Performance Characteristics

XC8109xC10ER



Ordering Information

XC8109①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	CE Logic	A	Active H
		B	Active L
②	Protection Circuits Type	C	Auto-recovery(*1)
		D	Lanch-off(*2)
③④	Max. Output Current	10	0.9A (* Adjustable current limit range:0.075A～1300mA)
⑤⑥-⑦(*3)	Package (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)

(*1) Over Current Protection, Reverse Current Prevention, and Thermal Protection are Auto-recovery.
(*2) Over Current Protection and Reverse Current Prevention are Latching, Thermal Protection is Auto-recovery.
(*3) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC8108 Series

85mΩ High Function Power Switch with Current Limit Adjustable Pin (0.9A～2.4A Current Limit Adjustable)

RoHS Compliant, Halogen Antimony FREE

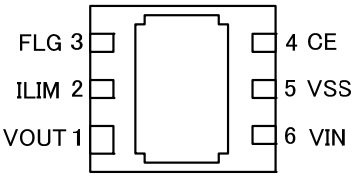
General Description

The XC8108 series is a P-channel MOSFET power switch IC with a low ON resistance.
A current limit, reverse current prevention (prevents reverse current from V_{OUT} to V_{IN}), soft start, thermal shutdown, and an under voltage lockout (UVLO) are incorporated as protective functions.
A flag function monitors the power switch status. The flag output has N-channel open drain structure, and outputs Low level signal while over-current or overheating is detected, or while the reverse current prevention is operated.
A variable current limiting function is integrated, allowing the current limit value to be set within the range of 0.9A to 2.4A (TYP.) using an external resistor. The IC can be put in the stand-by state using the level of the voltage applied to the CE pin. CE pin logic is available in two types, active high or active low.

Features

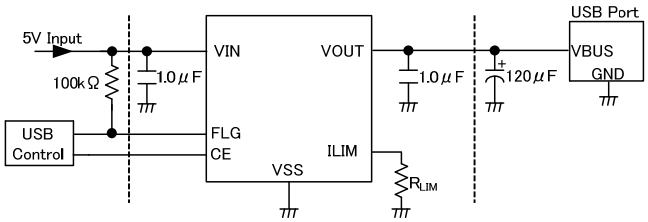
Input Voltage: 2.5V～5.5V
(Absolute Max. Rating: 6.0V)
Output Current: 2A
ON Resistance: 85mΩ @ V_{IN}=5.0V (TYP.)
Quiescent Current: 40μA @ V_{IN}=5.0V
Stand-by Current: 0.1μA (MAX.)
Flag Delay Time: 7.5ms (TYP.) @ Current Limit
4.0ms (TYP.) @ Reverse Current Prevention
Protection Circuit: Current Limit Adjustable
0.9A～2.4A (TYP.)
Reverse Current Prevention
Thermal Shutdown
Under Voltage Lockout (UVLO)
Soft-start
Functions: Flag Output
CE Pin Input Logic Selectable
Operating Ambient Temperature: -40℃～+105℃
Package: USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



USP-6C
(BOTTOM VIEW)

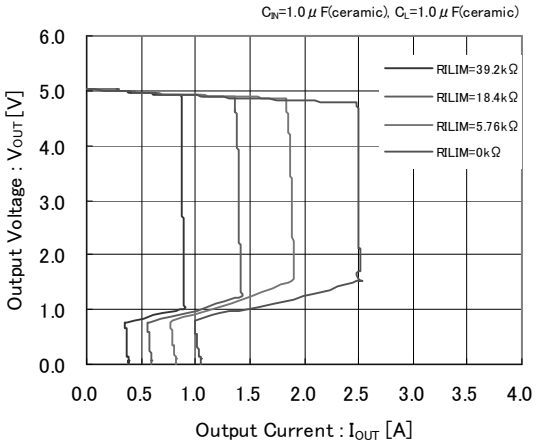
Typical Application Circuit



* The Typical circuit is base on USB high side switch.
The XC8108 series can accommodate 1μF output capacitor (C_L).

Typical Performance Characteristics

XC8108xC20ER



Ordering Information

XC8108①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	CE Logic	A	Active High
		B	Active Low
②	Protection Circuits Type	C	Auto-recovery (*1)
		D	Latch-off (*2)
③④	Max. Output Current	20	2.0A (Adjustable current limit range: 0.9A～2.4A)
⑤⑥-⑦ (*3)	Package (Order Unit)	ER-G	USP-6C (3,000pcs/Reel)

(*1) Over Current Protection, Reverse Current Prevention, and Thermal Protection are Auto-recovery.
(*2) Over Current Protection and Reverse Current Prevention are Latching, Thermal Protection is Auto-recovery.
(*3) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC8107 Series

85mΩ High Function Power Switch (Fixed Current Limit)

RoHS Halogen Antimony FREE

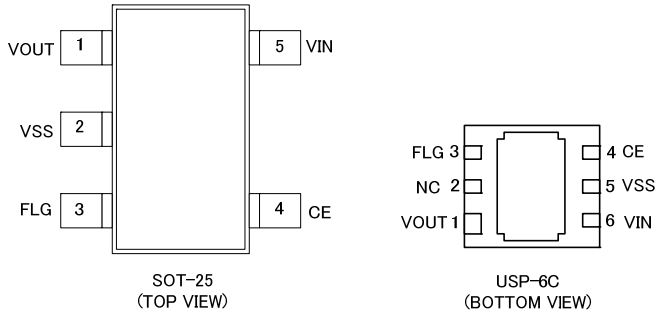
General Description

The XC8107 series is a P-channel MOSFET power switch IC with a low ON resistance.
A current limit, reverse current prevention (prevents reverse current from V_{OUT} to V_{IN}), soft start, thermal shutdown, and an under voltage lockout (UVLO) are incorporated as protective functions. A flag function monitors the power switch status. The flag output has N-channel open drain structure, and outputs Low level signal while over-current or overheating is detected, or while the reverse current prevention is operated.
The IC can be put in the stand-by state using the level of the voltage applied to the CE pin. High active or Low active can be selected for the CE pin input logic.

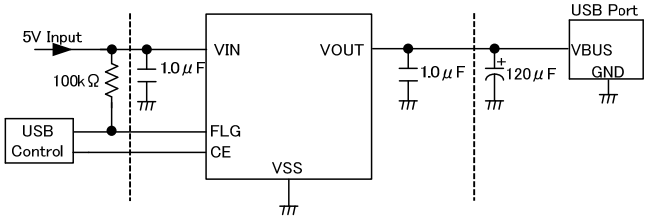
Features

Input Voltage: 2.5V～5.5V
(Absolute Max. Rating: 6.0V)
Output Current: 2A
ON Resistance: 85mΩ @ V_{IN}=5.0V (TYP.) *USP-6C
100mΩ @ V_{IN}=5.0V (TYP.) *SOT-25 (XC8107A, B)
95mΩ @V_{IN}=5.0V (TYP.) (XC8107X, Y)
Quiescent Current: 40μA @ V_{IN}=5.0V
Stand-by Current: 0.1μA (MAX.)
Flag Delay Time: 7.5ms (TYP.) @ Current Limit
4.0ms (TYP.) @ Reverse Current Prevention
Protection Circuit: Reverse Current Prevention
Thermal Shutdown
Under Voltage Lockout (UVLO)
Soft-start
Functions: Flag Output
CE Pin Input Logic Selectable
Operating Ambient Temperature: -40℃～+105℃
Packages: SOT-25 (Au wire or Cu wire), USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



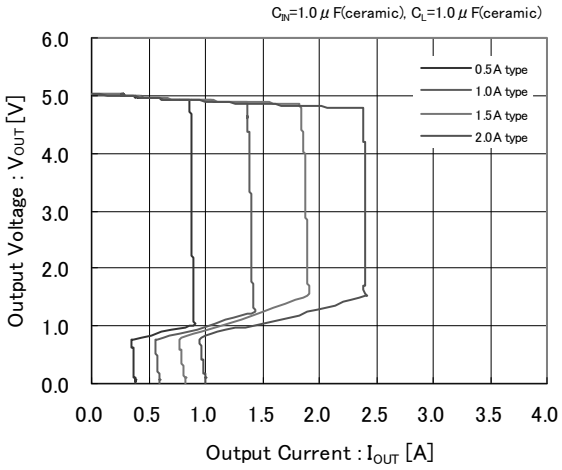
Typical Application Circuit



* The Typical circuit is base on USB high side switch.
The XC8107 series can accommodate 1μF output capacitor (C_L).

Typical Performance Characteristics

XC8107xCxxxR



Ordering Information

XC8107①②③④⑤⑥-⑦

DESIGNATOR	ITEM	Au wire	Cu wire	DESCRIPTION
①	CE Logic	A	X	Active High
		B	Y	Active Low
②	Protection Circuits Type	C		Auto-recovery
		D		Latch-off
③④	Max. Output Current	05		0.5A (0.9A)
		10		1.0A (1.4A)
		15		1.5A (1.9A)
		20		2.0A (2.4A)
⑤⑥-⑦(*1)	Packages (Order Unit)	ER-G		USP-6C (3,000pcs/Reel)(*2)
		MR-G		SOT-25 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) UPS-6C package is available for the A/B type.

XC8102 Series

400mA Small Load Switch with C_L Discharge

RoHS Compliant, Halogen Antimony FREE

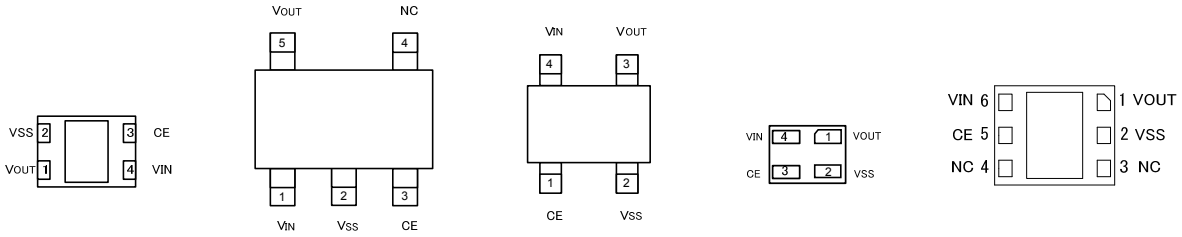
General Description

The XC8102 series is a low ON resistance load switch IC with ON/OFF control and output current protection which integrates a P-channel MOSFET.
By connecting the XC8102 to the output pin of a step-down DC/DC converter, the CE pin controls ON/OFF for each distribution switch to deliver power per requirements and maximize total power efficiency. As a result, the XC8102 helps to extend battery life and product operation time.
The series contains a current limit and protection circuit so these are not required externally unlike discrete circuit solutions where MOSFETs and resistors are used.
When a low signal is input to the CE pin, the series enters stand-by mode. Even where a load capacitor is connected to the output pin during stand-by, the electric charge stored at the load capacitor is discharged through the internal switch. As a result, the V_{OUT} pin voltage falls quickly to the V_{SS} level.
The series contains over current protection with fold-back current circuitry which operates as over current protection and short circuit protection for the output pin.

Features

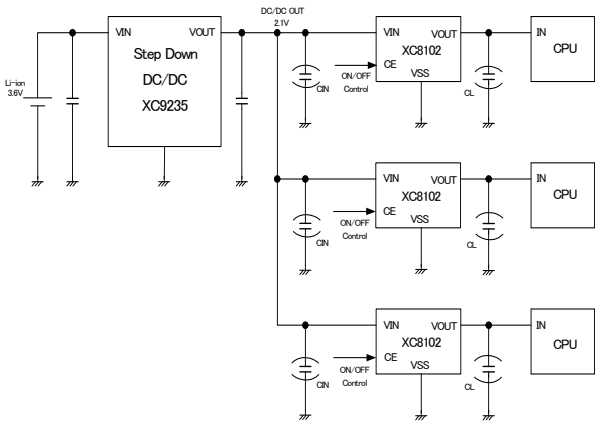
On Resistance:	0.28Ω @ V_{IN}=6.0V (TYP.) 0.31Ω @ V_{IN}=4.0V (TYP.) 0.35Ω @ V_{IN}=2.9V (TYP.) 0.52Ω @ V_{IN}=1.8V (TYP.) 0.60Ω @ V_{IN}=1.5V (TYP.) 0.80Ω @ V_{IN}=1.2V (TYP.)
Input Voltage Range:	1.2V～6.0V (Absolute Max. Rating:6.5V)
Quiescent Current:	3.0μA@ V_{IN}=1.2V 3.6μA@ V_{IN}=2.9V 4.0μA@ V_{IN}=6.0V
Stand-by Current:	0.1μA
Protection Circuit:	Current limit(Output Current) 480mA (TYP.) (1.8≦V_{IN}≦6.0V) Short Circuit Protection, Short current= 30mA (TYP.)
ON/OFF Function:	Enable Active High C_L High Speed Discharge
Operating Ambient Temperature:	-40℃～+85℃
Packages:	USP-4,SSOT-24, SOT-25, USPN-4, USP-6B06
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration



USP−4 (BOTTOM VIEW) | SOT−25 (TOP VIEW) | SSOT−24 (TOP VIEW) | USPN−4 (BOTTOM VIEW) | USP−6B06 (BOTTOM VIEW)

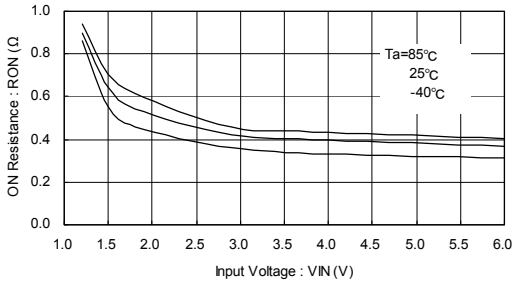
Typical Application Circuit



Typical Performance Characteristics

●On Resistance vs. Input Voltage

XC8102AA01M/XC8102AA01G
VIN=CE
IOUT=50mA
CIN=None,CL=None



Ordering Information

XC8102AA01①②-③

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②-③(*1)	Packages (Order Unit)	GR-G	USP-4 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)
		7R-G	USPN-4 (5,000pcs/Reel)
		8R-G	USP-6B06 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC8101 Series

Low Quiescent Current Load Switch

RoHS Halogen Antimony FREE

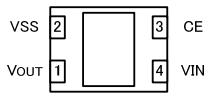
General Description

The XC8101 series is a low On resistance line switch IC with ON/OFF control which integrates P-channel MOSFET. The XC8101 is suited for power distribution switch. With connecting to the output pin of step-down DC/DC converters, the CE pin controls ON/OF for each distribution switch to deliver power per requirements and maximize total power efficiency. As result, the XC8101 helps extend battery life and product operation time. The XC8101 is available in an ultra small package USP-4 and does not require any external capacitors so that it can provide small power unit design and board space saving. When low signal is input to the CE pin, the XC8101 enters stand-by mode. Even where a load capacitor is connected to the output pin during in the stand-by mode, the internal switch between the V_{OUT} and V_{SS} of the XC8101 enables the electric charge in the load capacitor to be discharged. Because of this discharge function, the VOUT pin voltage falls quickly to V_{SS} level.
The XC8101 contains an over current protection with foldback current circuitry which operates as over current protection and short circuit protection for the output pin.

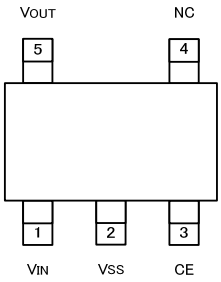
Features

On Resistance: 0.75Ω @ VIN=2.9V
1.15Ω @ VIN=1.8V
Output Current: 200mA
<Current Limit =300mA (TYP.)>
Input Voltage Range: 1.8V ~ 6.0V
(Absolute Max. Rating: 6.5V)
Quiescent Current: 3.0μA@ VIN=1.8V
Stand-by Current: 0.1μA
Protection Circuit: Current limit, 300mA (TYP.)
Short-circuit Protection,
Short current= 30mA (TYP.)
ON/OFF Function: High Active Enable
High-Speed Discharge Function
Operating Ambient Temperature: -40℃ ~ +85℃
Packages: USP-4, SSOT-24, SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

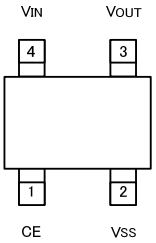
Pin Configuration



USP-4
(BOTTOM VIEW)

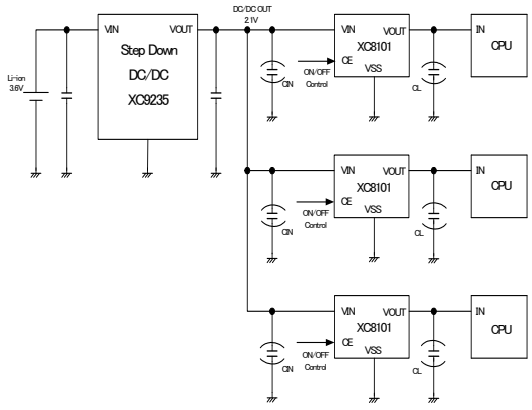


SOT-25
(TOP VIEW)



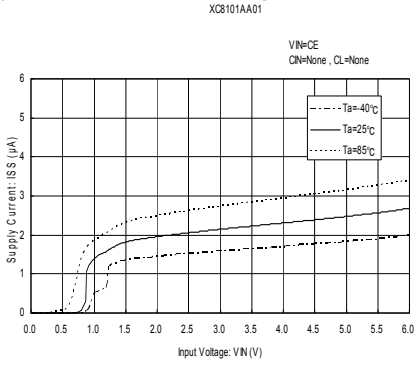
SSOT-24
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Supply Current vs. Input Voltage



Ordering Information

XC8101①②③④⑤⑥-⑦

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	CE pin logic	A	High active enable
②	C_L Discharge Function	A	Output capacitor (C_L) auto-discharge function integrated
③④	Internal Standard Number	01	Fixed
⑤⑥-⑦ (*1)	Packages (Order Unit)	GR-G	USP-4 (3,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		NR-G	SSOT-24 (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6192 Series

Push Button Load Switch

RoHS Halogen Antimony FREE

General Description

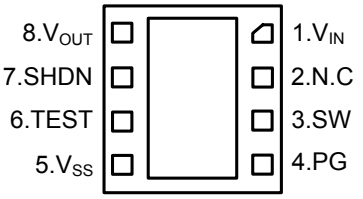
The XC6192 series are the Push Button load switch with functions best suitable for battery operated devices.
The built-in high side switch is turned on by the Push Button (Turning off is also possible on the XC6192A type.) and turned off by the "L" level signal into the SHDN pin from the MCU or the like.
In addition to these functions, this IC is equipped with output capacitor inrush current limiting function and short-circuit protection function, realizing an intelligent load switch.
The high side switch is turned on and latched by inputting "L" signal from the Push Button of the device to the SW pin.
It is possible to shut down (OFF) by inputting a 1-pulse signal of "H" level from the MCU or the like to the SHDN pin. This realizes a main switch of battery operated devices easily. (*1)
The leak current at shutdown is so small, which is 10nA(Typ.), that this IC will contribute to reducing the discharge of the battery and making shelf life longer of the devices after shipping as well as functioning as a main switch.
For the A type, it is possible to turn off forcibly in case of emergency by Push Button signal. This enables a freezed device to be turned off.
For the B type, turn-off is available only with SHDN pin.
The output capacitor inrush current limiting function suppresses excessive current that occurs when the switch is turned on, preventing it from going into a brownout state.
The output short-circuit protection function detects the voltage drop due to the short circuit and turns off the power supply line by force. The "L" signal on the SW pin by Push button makes the device recover.
The power good function is used to properly adjust the timing of turning on the DC-DC regulator or other system on the rear stage.

(*1) Please be sure to complete the preparation for shutting down safely before inputting the signal to SHDN pin from the MCU or the likes.
(*2) V_{OUT} may not start up completely if the load current is 350uA (DC) or more at starting up due to the output capacitor inrush current limiting function. Please design so that the started up load current is less than 350uA (DC) or the output on the rear stage is enabled by using the PG pin.

Features

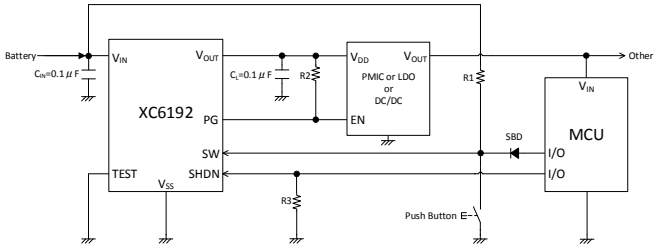
Input Voltage Range: 2.5V～6.0V (Absolute Max. Rating: 6.5V)
Stand-by Current: 0.01μA (TYP.)
Quiescent Current (Turn-On state): 0.45μA (TYP.)
Output Current: 400mA (V_{IN}=2.5V, Ta=25℃)
Turn-On Delay Time (T_{OND}): 0.5s, 1.0s, 3.0s, or 5s
Turn-Off Method:
Type A By inputting “H” voltage to the SHDN pin.
By inputting “L” voltage during the T_{OFFD} to the SW pin.
Type B By inputting “H” voltage to the SHDN pin.
Turn-Off Delay Time (T_{OFFD}): 3s, 5s, 10s, or 15s
Additional function: Power Good function (the PG pin)
Forced shutdown function (the SHDN pin)
Protection circuits: Inrush current protection
Output circuit short protection
Output capacitor discharge function
Operating Ambient Temperature: -40℃～+85℃
Package: USP-8B06

Pin Configuration



USP-8B06
(BOTTOM VIEW)

Typical Application Circuit



Ordering Information

XC6192①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	TYPE	A	Shutdown Mode: SW pin or SHDN pin
		B	Shutdown Mode: SHDN pin
②	Turn-On delay time	A	0.5s.
		1	1s. (*2)
		3	3s. (*2)
		5	5s. (*2)
③④	Turn-Off delay time	NN	XC6192B have no this function.
		03	3s. (*2)
		05	5s.
		10	10s.
		15	15s. (*2)
⑤⑥-⑦(*1)	Package (Order Unit)	ER-G	USP-8B06 (5,000pcs/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.
(*2) For option products, please contact your local Torex sales office or representative:

●Selection Guide

Parts No.	Turn-On Delay Time (s)	Turn-Off Delay Time (s)	Package
XC6192AA05	0.5s	5s	USP-8B06
XC6192AA10		10s	
XC6192BANN		No function	

XC6190 Series

Push Button Reboot Controller

General Description

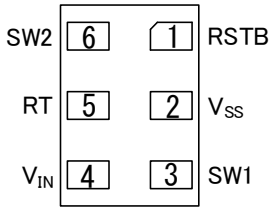
The XC6190 series are timer reset ICs that supply a reboot signal to the system when “L” voltage is input into the SW1, SW2 pins for a set time (reboot delay time) using two switches (physical buttons).
On type A, the reboot delay time (T_{DL}) can be set as desired by changing the external resistance R_T within the range 1s to 20s.
On type B, T_{DL} is fixed internally. When the TS pin is set to “H” level, the delay time is 12.5s. When the TS pin is set to “L” level, the delay time is 7.5s.
After the reboot signal (T_{RSTB}) is output for 0.4s (TYP), the IC automatically returns to the steady state.
Quiescent current in standby mode is a very small 0.01μA (TYP.), and this contributes to a longer battery drive time. The small USPN-6 and USPN-6B01 packages enable reduction of mounting space.
The UVLO function is equipped as a protective function to prevent malfunctioning of the IC.

Features

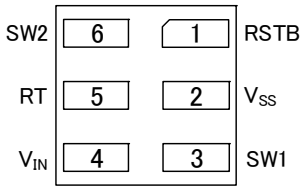
Input Voltage Range: 1.75V～6.0V
Low power Consumption: 0.01μA (Stand-by,TYP.)
Output Configuration: Nch Open Drain (XC6190AN/BN)
CMOS (XC6190AC/BC)
RSTB Pin SINK Current: 30mA (V_{RSTB}=0.3V)
Reboot Delay Time (Type A): 1s～20s
(Adjustable by the external resistor)
*12.5s±5% (RT=200kΩ)
Reboot Delay Time (Type B): 7.5s±5% (TS=GND),
12.5s±5% (TS=V_{IN})
Reboot Time: 0.4s±5%
Operating Ambient Temperature: -40℃～+85℃
Packages: USPN-6, USPN-6B01
Environmentally Friendly: RoHS Compliant, Pb Free

Pin Configuration

●XC6190AN15xx / XC6190AC15xx



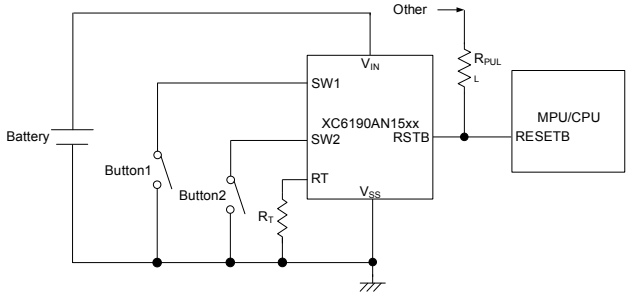
USPN−6B01
(BOTTOM VIEW)



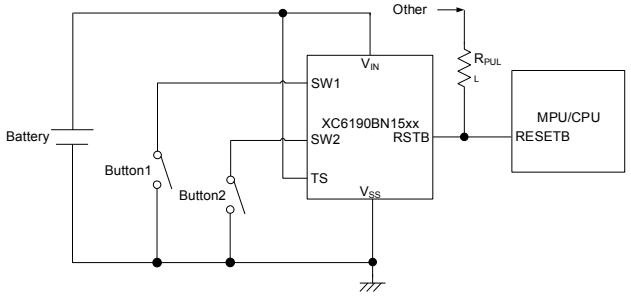
USPN−6
(BOTTOM VIEW)

Typical Application Circuit

●Type A One-Button Solution



●Type B Two-Button Solution



Ordering Information

XC6190①②③④⑤⑥-⑦

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Type	A	Reboot delay time set by the external resistance
		B	Reboot delay time internal fix.
②	Output Configuration	N	Nch open drain output
		C	CMOS output
③	Reboot delay time	1	Type A : 12.5s (RT=200kΩ)
		2	Type B : 7.5s(V_{TS}=”L”), 12.5s(V_{TS}=”H”)
④	Reboot delay time accuracy	5	±5%
⑤⑥-⑦(*1)	Packages (Order Unit)	7R-G	USPN-6 (5,000pcs/Reel)
		8R-G	USPN-6B01 (5,000pcs/Reel)

(*1) The “-G” suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) XC6190AC158R-G is under development.

■ About Torex Charger ICs

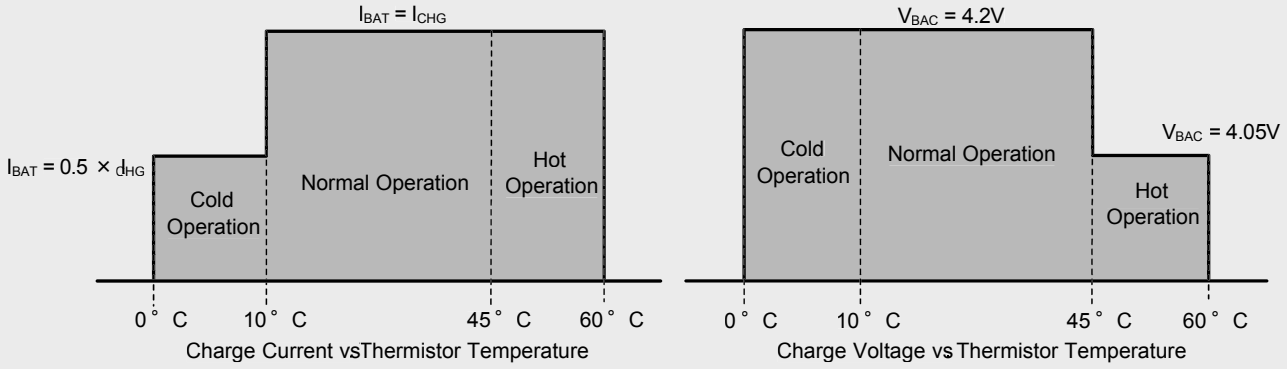
Torex Linear charger IC use constant-voltage (CV) and constant-current (CC) charging methods for charging single cell Li-ion or Li-polymer batteries. The internal charging cycle includes a trickle charging mode followed by a main charging mode. Our newer IC are also compatible with temperature control based on JEITA standards. For these new IC the internal circuit controls the CV charge voltage and CC charge current according to battery pack temperature and this ensures the safe charging of Li-ion and Li-polymer batteries.

By connecting an LED externally to the Charging Status Output pin (CSO) the user can easily confirm the the charging status visually by illuminating the LED.

Our line up also includes two IC optimised for small, low-capacity batteries. For these applications the minimum value of trickle charge current and charge completion current is 0.5mA. This ensures safer charging and longer battery life for wearable devices.

JEITA-Compliant Battery Temperature Monitoring Function

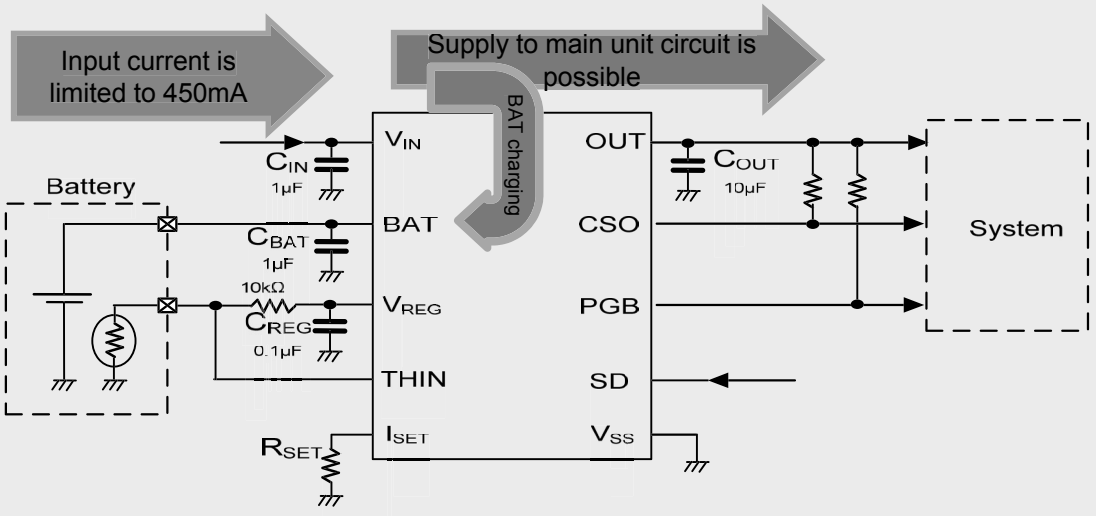
The battery temperature monitoring function monitors the temperature of an Li-ion battery during charging by use of an external NTC thermistor (hereafter “thermistor”) connected to a THIN pin. This allows safe charging by controlling the charge completion voltage and charge current according to the Li-ion battery temperature as shown in the following diagram.



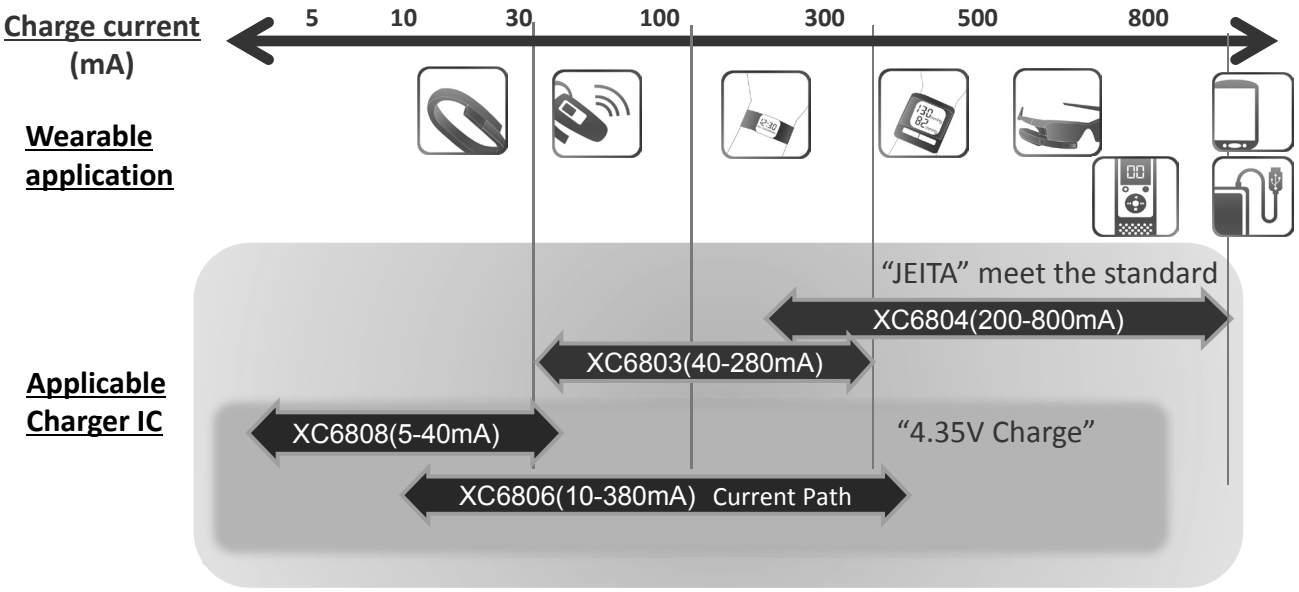
(Applicable ICs: XC6803, XC6804, XC6806, XC6808)

Current Path Function (Applicable IC: XC6806)

Power can be supplied to the system from the OUT pin while an Li-ion battery is charged at the same time from the BAT pin. An internal input current limiting function sets a limit so that current can be supplied while preventing the input (V_{IN}) from reaching an over-current condition.



■ Li-ion Battery Charger IC Selection Guide



		XC6801	XC6802	XC6803	XC6804	XC6808	XC6806
Charge Method		Linear					
		CC/CV					
Input Voltage Range		4.25V-6.0V	4.25V-6.0V	4.5V-6.0V	4.5V-6.0V	4.5V-6.0V	4.5V-5.5V
Charge Current		95mA/475mA	100~800mA	40mA~280mA	200mA~800mA	5mA~40mA	10mA~380mA
Charge Termination Voltage		4.20V	4.20V	4.20V	4.20V	4.20V 4.35V 4.40V	3.5-4.45V
Trickle Charge Mode		○	○	○	○	Optional	○
Trickle Charge Voltage		2.90V	2.90V	2.90V	2.90V	2.90V	2.90V
Recharge function		○	○	Optional	Optional	○	○
Recharge Battery Voltage(Ta=25℃)		Δ150mV	Δ150mV	3.9V	3.9V	3.9V	Δ100mV
Current Path function		-	-	-	-	-	○
Shutdown function		-	-	-	-	-	○
Battery Temperature Monitor		-	-	○	Optional	○	○
		-	-	JEITA ○	JEITA ○	JEITA ○	JEITA ○
Safety Timer Function	Main Charge	-	-	5hs	10hs	5hs or 10hs	5hs
	Trickle Charge	-	-	0.5hs	2hs	0.5hs	0.5hs
Battery Pin Reverse Current		2uA (MAX.)	1uA (MAX.)	0.5uA	5uA	0.1μA	0.1μA
UVLO		○	○	○	○	○	○
Thermal Shutdown		○	○	○	○	○	-
Thermal Control		-	-	-	-	-	○
Input Voltage Dropout Monitoring function		○	○	○	○	○	○
Charging Over-Voltage monitor function		○	○	○	○	-	-
Charging Over-Current monitor function		○	○	○	○	○	-
Package			USP-6EL	USP-6EL	USP-6EL	USP6B07	USP-10B
		USP-6C	USP-6C	-	SOP-8FD		LGA-10B01
		SOT-25	SOT-25	-	-	-	-
		SOT-89-5	SOT-89-5	-	-	-	-

XC6808 Series

4.35V 1 Cell Li-ion and Li-Po Battery Linear Charger IC with Battery Temperature Detection (CC Charge: 5～40mA)

RoHS Compliant, Halogen Antimony FREE

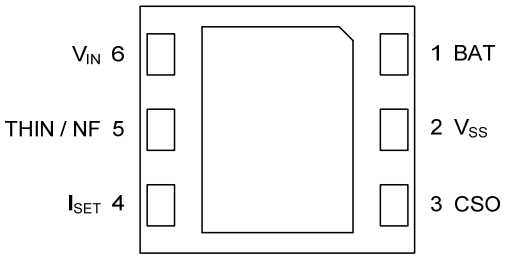
General Description

The XC6808 is a Constant-Voltage and Constant-Current linear charger for single-cell Li-ion and Li-polymer batteries.
When the input supply is removed, XC6808 automatically enters a low battery leakage state, reduce the battery leakage current to 0.1μA (TYP.). This IC supports temperature control based on JEITA, it possible to safely charge batteries by controlling the CV charge voltage and CC charge current according to the temperature.
The basic charging cycle consists of trickle charge mode followed by main charge mode. By connecting a resistor to the charge status output pin, it is possible to check the charge condition via the charge status output (CSO) pin voltage. The IC is housed in the small and low profile USP-6B07 package, and a charge circuit can be configured using a minimum of external components.

Features

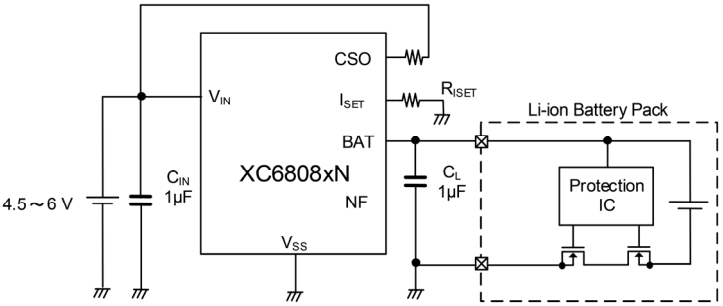
●JEITA conforming Thermistor Detect Function Built-in
0.1μA (TYP.) Battery Leakage Current in Shutdown Mode
Low Profile Package: USP-6B07 (1.8mm x 2.0mm x 0.33mm)
Operating Voltage Range: 4.5V ~ 6V (Absolute Max. Rating: 6.5V)
Supply Current: 100μA (V_{IN}=5V, V_{BAT}=3.5V)
CC Charge Current: 5mA ~ 40mA (Can be set by external resistance)
CV Charge Voltage: 4.20V, 4.35V, 4.40V (Can be serected)
Protection Circuit: Thermistor detection function (Except for the XC6808xN)
Safety timer function
UVLO (Under Voltage Lock Out)
Thermal shutdown (Latch Stop)
Dropout voltage monitor function
Charging over-current monitor function
Recharge function
Operating Ambient Temperature: - 40°C ~ +85°C

Pin Configuration



USP-6B07
(BOTTOM VIEW)

Typical Application Circuit



Ordering Information

XC6808①②③④⑤⑥-⑦

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Charge Status Output on Abnormal Mode	A	1 kHz ON-OFF
		B	OFF * Option
②	Battery Temperature Monitor Function	2	2 Temperature Monitor * Option
		3	3 Temperature Monitor * Option
		4	4 Temperature Monitor
		N	No Temperature Monitor
③	CV Charge Voltage	C	4.20V
		D	4.35V
		E	4.40V
④	Main Charge Hold Time & Trickle Charge Function	1	Hold Time:5h, Trickle Charge: Enable
		2	Hold Time: 10h, Trickle Charge: Enable
		3	Hold Time: 5h, Trickle Charge: Disable
		4	Hold Time: 10h, Trickle Charge: Disable
⑤⑥-⑦(*1)	Package (Order Unit)	8R-G	USP-6B07 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6806 Series

Linear Charger IC with Current Path Function (CC Charge:10～380mA)

RoHS Halogen Antimony FREE

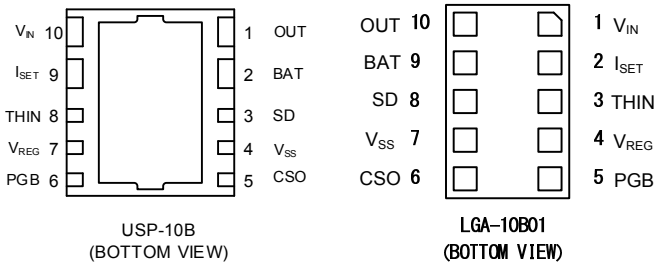
General Description

Equipped with a system power supply function, the XC6806 is a linear charger IC for single-cell lithium ion batteries and lithium polymer batteries. IC control gives system power supply priority over charging the lithium ion battery. The charge current can be adjusted with an external resistance, and an internal limit circuit with an input current of 450mA automatically reduces the charging current based on the load current that flows to the system.
The lithium ion battery temperature is monitored in conformance with JEITA, and by controlling the charge voltage and charge current as appropriate for the temperature, the battery can be charged safely. Internal protective functions include a safety timer function, UVLO function, thermal control function, and reverse current protection function.
In addition, a shutdown function completely shuts off power supply from the battery to the system to prevent battery leakage current while the device is not in use, and this enables longer use of low supply current devices that operate using a small battery.
The IC is mounted in the small, high heat dissipation USP-10B or LGA-10B01 package, and a charging circuit can be designed with minimal external components.

Features

●Current Path Function
●JEITA conforming Thermistor Detect Function Built-in
Operating Voltage Range: 4.5V～5.5V
CC Charge: 10mA～380mA Can be set by external resistance
CV Charge: 3.5V～4.45V
Input current limit: 450mA, fixed internally
Protection Circuit: Safety timer function
UVLO (Under Voltage Lockout)
Thermal shutdown
Dropout Voltage Monitor Function
Operating Ambient Temperature: -40℃～+85℃
Packages: USP-10B, LGA-10B01
Environmentally Friendly: EU RoHS Compliant, Pb Free

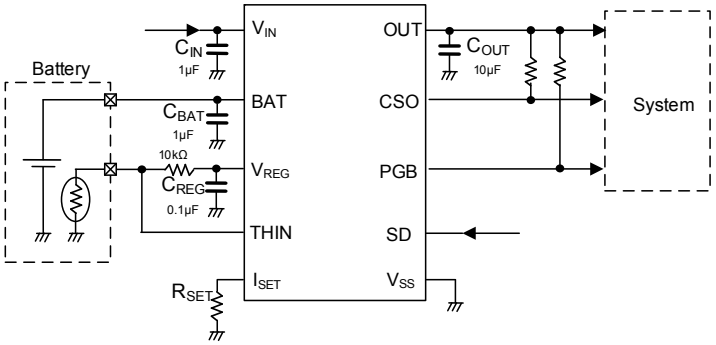
Pin Configuration



USP-10B
(BOTTOM VIEW)

LGA-10B01
(BOTTOM VIEW)

Typical Application Circuit



Ordering Information

XC6806①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	TYPE	A	4 Temperature Monitor (JEITA Compliant)
		B	3 Temperature Monitor (Semi-custom)
		C	2 Temperature Monitor (Semi-custom)
②③④	Charge Voltage	350~445	3.50V~4.45V
⑤⑥-⑦(*1)	Packages (Order Unit)	DR-G	USP-10B (3,000pcs/Reel)(*2)
		11-G	LGA-10B01 (5,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.
(*2) The reels are shipped in a moisture-proof packing. Please consult with your Torex sales contact.

XC6804 Series

One Cell Li-ion / Li-polymer Linear Charger IC with Battery Temperature Detection (CC Charge:200～800mA)

RoHS Compliant, Halogen Antimony FREE

General Description

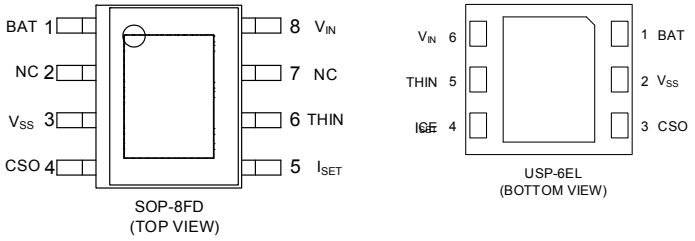
The XC6804 is a Constant-Voltage (CV) and Constant-Current (CC) type charging IC for linear charging of single-cell Li-ion batteries and Li-polymer batteries. The basic charging cycle consists of trickle charge mode followed by main charge mode. This IC supports temperature control based on JEITA, making it possible to safely charge Li-ion batteries and Li-polymer batteries by controlling the CV charge voltage and CC charge current according to the temperature. By connecting a resistor to the charge status output pin, it is possible to check the charge condition via the charge status output (CSO) pin voltage. The IC is housed in the small SOP-8FD or USP-6EL package with high heat dissipation, and a charge circuit can be configured using a minimum of external components.

Features

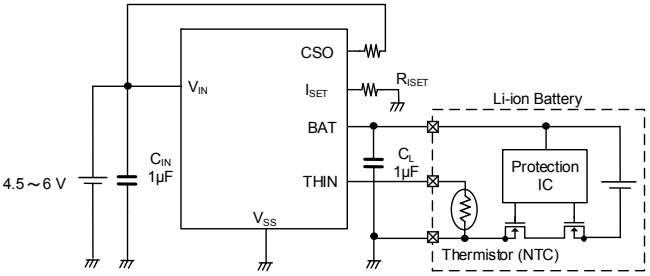
●JEITA conforming Thermistor Detect Function Built-in

Operating Voltage Range: 4.5V～6.0V
Quiescent Current: 100μA (TYP.)
CC Charge: 200mA～800mA Can be set by external resistance
CV Charge: 4.2V, 4.05V(at high temperature) Internally fixed
Protection Circuit: Thermistor detection function
Safety timer function
UVLO
Thermal shutdown
Charging over-voltage monitor function
Charging over-current monitor function
Recharge function (XC6804xxE)
Operating Ambient Temperature: -40℃～+85℃
Packages: SOP-8FD,USP-6EL
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

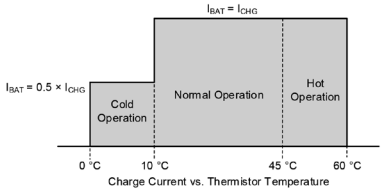


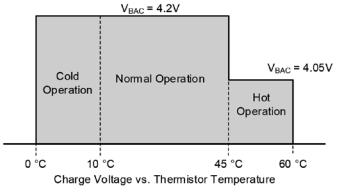
Typical Application Circuit



Typical Performance Characteristics

●Temperature monitor function





Ordering Information

XC6804①②③④⑤⑥-⑦

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Charge Status Output on Abnormal Mode	A	1kHz ON-OFF
		B	OFF
②	Battery Temperature Monitor Function	2	2 Temperature Monitor
		3	3 Temperature Monitor
		4	4 Temperature Monitor
③	Recharge Function	E	Enable
		D	Disable
④	CV Charge Voltage	1	4.2V (Fixed)
⑤⑥-⑦(*1)	Packages (Order Unit)	QR-G	SOP-8FD (1,000pcs/Reel)
		4R-G	USP-6EL (3,000pcs/Reel)

(*1) The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.

XC6803 Series

One Cell Li-ion / Li-polymer Linear Charger IC with Battery Temperature Detection (CC Charge:40～280mA)

General Description

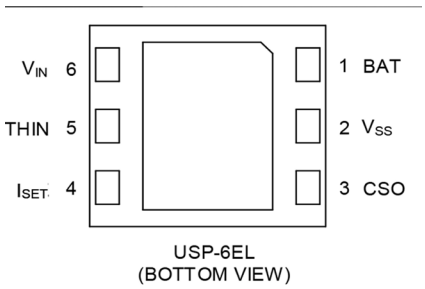
The XC6803 is a Constant-Voltage (CV) and Constant-Current (CC) type charging IC for linear charging of single-cell Li-ion batteries and Li-polymer batteries. The basic charging cycle consists of trickle charge mode followed by main charge mode. This IC supports temperature control based on JEITA, making it possible to safely charge Li-ion batteries and Li-polymer batteries by controlling the CV charge voltage and CC charge current according to the temperature. By connecting a resistor to the charge status output pin, it is possible to check the charge condition via the charge status output (CSO) pin voltage. The IC is housed in the small USP-6EL package with high heat dissipation, and a charge circuit can be configured using a minimum of external components.

Features

●JEITA conforming Thermistor Detect Function Built-in

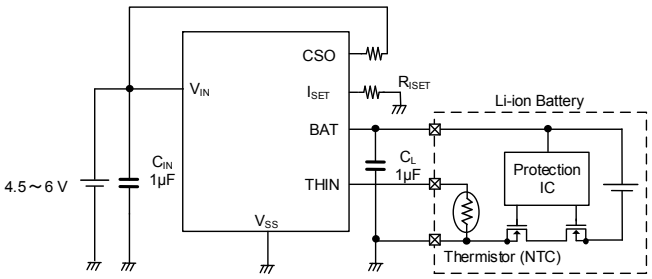
Operating Voltage Range: 4.5V～6.0V
Quiescent: 100μA (TYP.)
CC Charge: 40mA～280mA Can be set by external resistance
CV Charge Voltage: 4.2V, 4.05V (at high temperature) Internally fixed
Protection Circuit: Thermistor detection function
Safety timer function
UVLO
Thermal shutdown
Dropout voltage monitor function
Charging over-voltage monitor function
Charging over-current monitor function
Recharge function (XC6803xxE)
Operating Ambient Temperature: -40℃～+85℃
Package: USP-6EL
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration



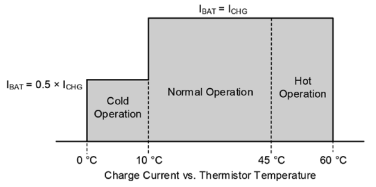
USP-6EL
(BOTTOM VIEW)

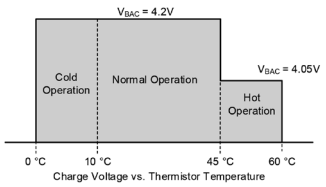
Typical Application Circuit



Typical Performance Characteristics

●Temperature monitor function





Ordering Information

XC6803①②③④⑤⑥-⑦

DESIGNATOR	DESCRIPTION	SYMBOL	DESCRIPTION
①	Charge Status Output on Abnormal Mode	A	1kHz ON-OFF
		B	OFF
②	Battery Temperature Monitor Function	2	2 Temperature Monitor
		3	3 Temperature Monitor
		4	4 Temperature Monitor
③	Recharge Function	E	Enable
		D	Disable
④	CV Charge Voltage	1	4.2V (Fixed)
⑤⑥-⑦(*1)	Package (Order Unit)	4R-G	USP-6EL (3,000pcs/Reel)

(*1) The "-G" suffix indicates that the products are Halogen and Antimony free as well as being fully RoHS compliant.

XC6802 Series

100～800mA 1 Cell Li-ion and Li-Po Battery Linear Charger IC with Constant-Current/Constant-Voltage

RoHS Compliant, Halogen Antimony FREE

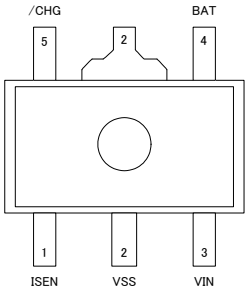
General Description

The XC6802 series is a constant-current/constant-voltage linear charger IC for single cell Lithium-ion and Lithium polymer batteries. The battery charge termination voltage is internally set to 4.2V ±0.7% and the trickle charge voltage and accuracy is 2.9V ±3.0%. In trickle charge mode, a safe Lithium-ion and Lithium polymer charge to a battery is possible because approximately 1/10 out of setting charge current is supplied to the battery. With an external RSEN resistor, the charge current can be set freely up to 800mA (MAX.), therefore, the series is ideal for various battery charge applications. The series' charge status output pin, /CHG pin, is capable of checking the IC's charging state while connecting with an external LED.

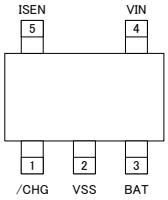
Features

Operating Voltage Range: 4.25V ~ 6.0V
(Absolute Max. Rating: 6.5V)
Charge Current: Externally set up to 800mA (MAX.)
Charge Termination Voltage: 4.2V ±0.7%
Trickle Charge Voltage: 2.9V ±3.0%
Quiescent Current (Stand-by) : 15μA (TYP.)
Packages: SOT-89-5, SOT-25, USP-6C, USP-6EL
Option: Constant-current/constant-voltage operation with thermal shutdown
Automatic recharge
Charge status output pin
Soft-start function (Inrush limit current)
Operating Ambient Temperature: -40°C ~+85°C
Environmentally Friendly: EU RoHS Compliant, Pb Free

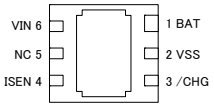
Pin Configuration



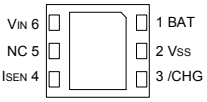
SOT-89-5
(TOP VIEW)



SOT-25
(TOP VIEW)

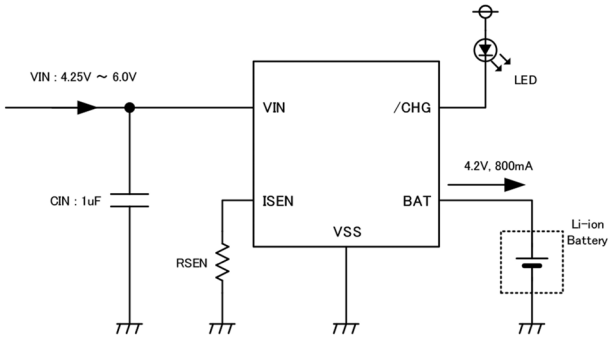


USP-6C
(BOTTOM VIEW)



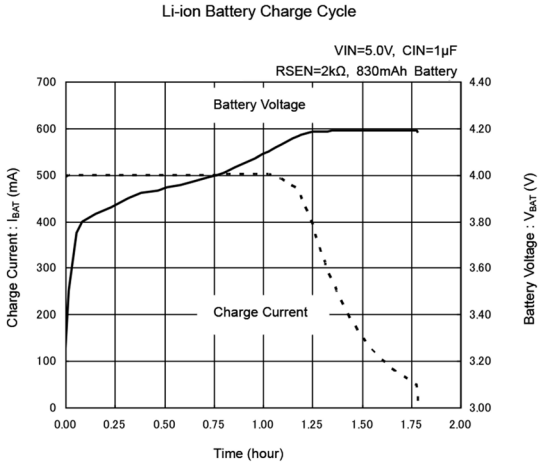
USP-6EL
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Battery Charge Cycle



Ordering Information

XC6802A42X①②-③

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②-③(*1)	Packages (Order Unit)	PR-G	SOT-89-5 (1,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)
		4R-G	USP-6EL (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

XC6801 Series

500mA 1 Cell Li-ion and Li-Po Battery Linear Charger IC with Constant-Current/Constant-Voltage

Halogen Antimony FREE

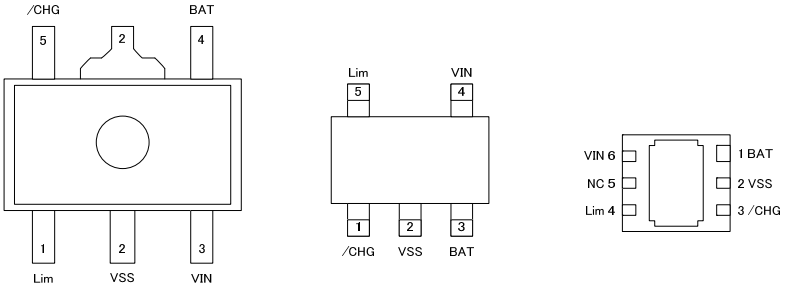
General Description

The XC6801 series is a constant-current/constant-voltage linear charger IC for single cell Lithium-ion and Lithium polymer batteries. The battery charge termination voltage is internally set to 4.2V ±0.7% and the trickle charge voltage and accuracy is 2.9V ±3.0%. In trickle charge mode, a safe Lithium-ion and Lithium polymer battery charge is possible because approximately only 1/10 of the full charge current is supplied to the battery. As it is possible to select a USB charge current of either 100mA (MAX.) or 500mA (MAX.) by using the Lim pin, the series is ideal for applications where the charge is from USB power. The series' charge status output pin, /CHG pin, is capable of checking the IC's charging state via connection to an external LED.

Features

Operating Voltage Range: 4.25V ~ 6.0V
(Absolute Max. Rating: 6.5V)
USB Charge Current: 100mA or 500mA Pin-Selectable
Charge Termination Voltage: 4.2V ±0.7%
Trickle Charge Voltage: 2.9V ±3.0%
Quiescent Current (Stand-by) : 12μA (TYP.)
Packages: SOT-89-5, SOT-25, USP-6C
Option: Constant-current/constant-voltage operation with thermal shutdown
Automatic recharge
Charge status output pin
Soft-start function (Inrush limit current)
Operating Ambient Temperature: -40°C ~+85°C
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

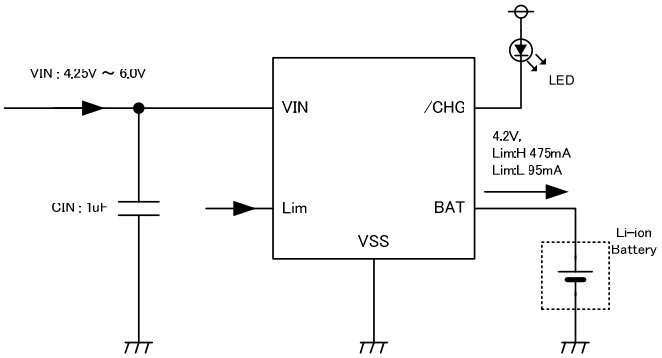


SOT-89-5 (TOP VIEW)

SOT-25 (TOP VIEW)

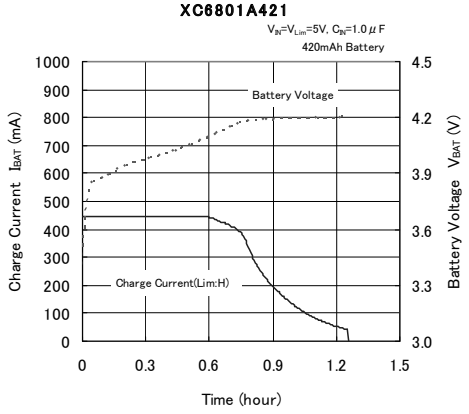
USP-6C (BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics

●Battery Charge Cycle



Ordering Information

XC6801A42①②③-④

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Setting Charge Current	1	LIM"L"=95mA, LIM"H"=475mA
②③-④(*1)	Packages (Order Unit)	PR-G	SOT-89-5 (1,000pcs/Reel)
		MR-G	SOT-25 (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

■Torex's Automotive ICs

The use of electronics began with stereos and air conditioners. It then spread to information devices such as automotive meters, car navigation, and ETC. As we move into the future, the incorporation of electronic devices will accelerate to provide greater peace of mind, safety, and comfort. The advance of electronics will further increase the amount of power consumed by devices and elevate the importance of power ICs.

As Japan's only exclusive manufacturer of power ICs, Torex has been supplying power ICs to a wide range of customers since its inception. By applying our unique small-size and low-consumption technologies, we are able to provide highly integrated solutions, optimized for automotive electronic devices. Our benefits include:

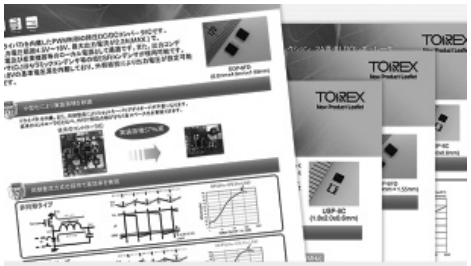
- ■ Small package sizes, giving engineers more freedom with design layouts.
- ■ High-efficiency power supplies with small overall circuit size.
- ■ High-efficiency power supplies to minimize heat and improve power dissipation
- ■ Longevity of supply, so you can use the product with peace of mind.

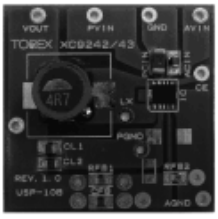
Compliant with AEC-Q100
Torex automotive ICs conform with AEC-Q100 (reliability and quality testing standard for integrated circuits), which was established by the AEC (Automotive Electronics Council: a standardization organization for automotive electronic component reliability).
A characteristic of AEC-Q100 reliability testing that distinguishes it from commercial electronics is a higher number of tested samples and tested lots. Automotive evaluation based on this standard ensures that automotive products have high quality.

Quality Management
Torex is a "Fab-less manufacturer", meaning we do not have our own wafer production.
However, Torex implements process control using SPC (Statistical Process Control) and MSA (Measurement System Analysis). Control standards for manufacturing conform to AEC-Q001, 002, and other guidelines. We will also provide PPAP (Production Part Approval Process) documentation upon customer request.

Enhanced Traceability
If a problem occurs, Torex will take immediate action and has implemented strengthened traceability to minimize adverse effects.
Sales traceability: Tracking of delivery destinations and counts by lot control
Manufacturing traceability: Tracking of manufacturing logs by lot control

Design Support
In addition to detailed information on each product, we can also provide evaluation boards for many products.





Evaluation Board

Applications
With small size and low consumption, Torex power ICS are used in a variety of automotive applications.

*** Examples of automotive use**

Information devices
Car navigation
Car audio
Display audio
ETC / DSRC

Accessories
Drive recorder
Keyless entry
GPS module
In-car microphone

Other devices
Vehicle camera
Touch panel
Smart antenna
Steering switch

Body
Power windows
Meters, air conditioning
Seat control, mirrors
Power sliding doors

How to identify Torex automotive product part numbers
Part numbers of automotive products are indicated in the following formats.

General consumer products: XCxxxxxxxxxx-G
Automotive products: X**D**xxxxxxxxxx-**Q**

”D”: Test control and assembly control implemented for automotive use.
“Q”: AEC-Q100, halogen & antimony free, EU RoHS compliant product.

(Example)
General consumer product: XC9260A08DPR-G
Automotive product: X**D**9260A08DPR-**Q**

Car electronics support, XD series website
Please visit the automotive products page of our corporate site. This page provides detailed product information. You can download data sheets and other technical information.

Torex Car Electronics

https://www.torexsemi.com/by-application/car/

Torex's automotive products (XD series) comply with the guidelines of AEC-Q100.
This standard, which was established by the AEC (Automotive Electronics Council), prescribes reliability tests and quality tests for integrated circuits. Stricter requirements are adopted than for consumer electronics to ensure high quality in automotive products.
When a problem occurs, a traceability system enables a quick response, including tracing of the product and analysis at bases inside the country.

- XD Series Supporting Car Electronics
- Differences between car electronics (XD series) and consumer electronics (XC series)
- Applications of automotive products
- Examples of applications
- Frequently asked questions about automotive products
- Key points when selecting ICs for car electronics

■Automotive IC Selection Guide

: Product currently under development

Step-Down DC/DC Converters

SERIES	OPERATING TEMPERATURE RANGE	CONTROL	OPERATING VOLTAGE (MAX.RATING)	OUTPUT VOLTAGE	ACCURACY	OUTPUT CURRENT	OSCILLATION FREQUENCY	PACKAGE	FUNCTIONS
XD9260	-40 ～ +105℃	PWM	2.7～5.5V (6.2V)	0.8～3.6V	±2.0%	1.5A	1.2MHz/3MHz	USP-6C	Synchronous, overheat protection, over-current protection, soft-start, C_L auto discharge (Type B), UVLO, HiSAT-COT Control
XD9261		PWM/PFM							
XD9242	-40 ～ +85℃	PWM	2.7～6.0V (7.0V)	Externally set (0.9～Vin)	±2.0%	2A	1.2MHz/2.4MHz	USP-10B	Synchronous, overheat protection, over-current protection, soft-start, UVLO, C_L auto discharge, "power good" output (USP-6C)
XD9243		PWM/PFM							
XD9263	-40 ～ +105℃	PWM	3.0～18.0V (20.0V)	Externally set (1.0～15V)	±1.5%	500mA	2.2MHz	SOT-25 USP-6C	Synchronous, overheat protection, over-current protection, soft-start, UVLO, "power good" output (USP-6C)
XD9264		PWM/PFM							
XD9267	-40～105℃	PWM	3.0～36.0V	Externally set (0.9～VIN)	±1.5%	600mA	2.2MHZ	SOT-89-5 USP-6C	Synchronous, overheat protection, over-current protection, soft-start, UVLO, CL auto discharge, "Power Good" output (USP-6C),Automatic Recorvery,Short Circuit Protection
XD9268		PWM/PFM							

Key point! DC/DC converters

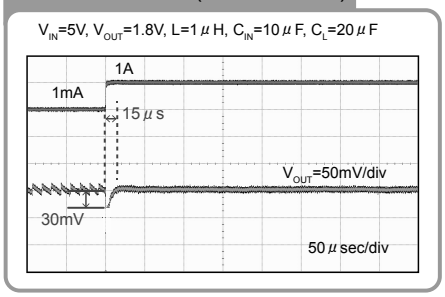
Torex DC/DC converters use **HiSAT-COT control**, Torex's unique **Hi**gh-**S**peed **A**rchitecture for fast **T**ransient response technology. (Applicable products: XD9260/XD9261, XDL601/XDL602)

HiSAT-COT

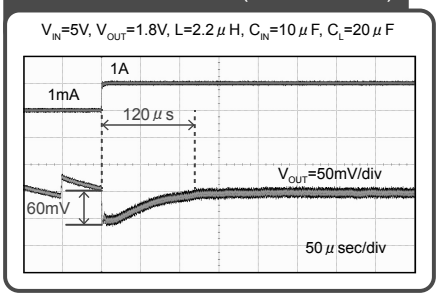
High Speed circuit Architecture for Transient with Constant On Time
High-speed transient response COT=PFM Mode

Load transient response characteristics show the Voltage drop is reduced by 50% and the recovery time is 8 times faster compared to previous products.

XD9260/XD9261 (fosc=3.0MHz)



Conventional DC/DC (fosc=2.4MHz)



Inductor Built-in micro DC/DC Converters

SERIES	OPERATING AMBIENT TEMPERATURE	CONTROL	INPUT VOLTAGE (Max. Rating)	OUTPUT VOLTAGE	ACCURACY	OUTPUT CURRENT	OSCILLATION FREQUENCY	PACKAGE	FUNCTIONS
XDL601	-40～105℃	PWM	2.7～5.5V (6.2V)	0.8,1.0,1.1,1.2,1.25, 1.3,1.35,1.5,1.8,2.5,3. 0,3.3V	±2.0%	1.5A	3MHz	DFN3625-11A	**Synchronous rectification, heating protection, over-current protection, soft-start, CL high-speed discharge (B type), UVLO, HiSAT-COT control**
XDL602		PWM/PFM							
XDL603	-40～105℃	PWM	3.0～18.0V (20.0V)	Externally set (1.0～15V)	±1.5%	500mA	2.2MHZ	DFN3625-11A	**Synchronous, overheat protection, over-current protection, soft-start, UVLO, Power Good output**
XDL604		PWM/PFM							
XDL605	-40～105℃	PWM	3.0～36.0V	Externally set (1.0～25V)	±1.5%	600mA	2.2MHz	DFN3625-11A	**Synchronous, overheat protection, over-current protection, soft-start, UVLO,Power Good output,Automatic Recorvery,Short Circuit Protection**
XDL606		PWM/PFM							

Key point! Coil-integrated micro DC/DC converters

Coil-integrated DC/DC converters have the following advantages.

(1) Simplified design
The only peripheral components are two external capacitors, so less design evaluation time is needed.

(2) Less Radiated noise
The circuitry inside the package is optimized to minimize switching noise and achieve low EMI.

(3) Space saving and simplified PCB layout
Minimal board-wiring is needed for peripheral components, increasing space-saving advantages.

(4) Thermal design is easy
The power circuit and heat dissipation structure are optimized to achieve very small, highly-efficient DC/DC converters.

■Automotive IC Selection Guide ▭ : Product currently under development

Voltage Detectors

SERIES	OPERATING TEMPERATURE RANGE	INPUT VOLTAGE (MAX.RATING)	VOLTAGE DETECT	DETECT VOLTAGE	ACCURACY	HYSTERESIS	QUIESCENT CURRENT	RELEASE DELAY TIME	WATCH DOG	PACKAGE	FUNCTIONS
XD6121 XD6122 XD6123 XD6124	-40 ～ +85℃	1.0～6.0V (7.0V)	VIN	1.6V,2.2V,2.3V, 2.4V,2.9V,3.0V, 3.1V,4.4V,4.5V, 4.6V	±2.0%	5%	10μA	Yes (internal)	O	SOT-25	Various internal delay times and internal watchdog timeout times available; Watchdog function ON/OFF setting
XD6130	-40 ～ +125℃	1.5～6.0V (7.0V)	VIN	1.6V, 2.2V, 2.3V, 2.4V, 2.9V, 3.0V, 3.1V, 4.4V, 4.5V, 4.6V	±1.0%	5%	9.8μA	Yes (external adjustment)	O	SOT-26	External capacitor delay type; Combined-use setting pins for both watchdog timeout time and release delay time;Manual reset function
XD6131	-40 ～ +125℃	1.5～6.0V (7.0V)	VIN	1.6V, 2.2V, 2.3V, 2.4V, 2.9V, 3.0V, 3.1V, 4.4V, 4.5V, 4.6V	±1.0%	5%	9.8μA	Yes (external adjustment)	O	SOT-26	External capacitor delay type; Combined-use setting pins for both watchdog timeout time and release delay time; Watchdog function ON/OFF setting
XD6132	-40 ～ +125℃	1.6～6.0V (7.0V)	SENSE	1.0V	±1.2%	0.10%	1.65μA	Yes (external adjustment)	-	SOT-26 USP-6C	Surge voltage protection function; External capacitor delay type; Selectable H or L output logic; External hysteresis adjustment possible
XD6133	-40 ～+125℃	1.6～6.0V (7.0V)	SENSE	1.3V, 1.6V, 2.2V, 2.3V, 2.4V, 2.9V, 3.0V, 3.1V, 4.4V, 4.5V, 4.6V	±1.2%	5%	1.65μA	Yes (external adjustment)	-	SOT-26 USP-6C	External capacitor delay type; Selectable H or L output logic

Key point! Voltage detectors

Torex voltage detectors support an ambient operating temperature of 125C°, and can be used in harsh usage environments. (Applicable products: XD6130/XD6131, XD6132/XD6133)

In addition, a variety of functions are provided, such as
☆ Hysteresis can be set as desired with a single resistor (applicable product: XD6132)
☆ A surge voltage protection function eliminates the need for a clamp diode (applicable product: XD6132)
☆ Release delay time is incorporated (applicable product: XD6121 to 24)
☆ Watchdog function ON/OFF (applicable product: XD6121 to 24, XD6131)

Voltage Regulators

SERIES	OPERATING TEMPERATURE RANGE	OUTPUT CURRENT	INPUT VOLTAGE (MAX.RATING)	OUTPUT CURRENT	OUTPUT CURRENT ACCURACY	QUIESCENT CURRENT	DROPOUT VOLTAGE @ 100mA	PACKAGE	FUNCTIONS
▭ XD6702	-40～105℃	300mA	4.5～36V (42V)	1.8, 2.5, 2.8, 3.0, 3.3, 5.0, 8.0V	±1.0%	40μA	350mV	SOT-89-5	Current limitter, overheat protection, soft-start、65dB@1kHz

*GreenOperation-compatible

XDL601/XDL602 Series

1.5A Inductor Built-in Step-Down "micro DC/DC" Converters

RoHS Halogen Antimony FREE

AEC-Q100 Grade2

General Description

The XDL601/XDL602 series is a synchronous step-down micro DC/DC converter which integrates an inductor and a control IC in one tiny package. An internal coil simplifies the circuit and enables minimization of noise and other operational trouble due to the circuit wiring. A wide operating voltage range of 2.5V to 5.5V enables support for applications that require an internally fixed output voltage (0.8V, 1.0V, 1.1V, 1.2V, 1.25V, 1.3V, 1.35V, 1.5V, 1.8V, 2.5V, 3.0V and 3.3V). The XDL601/XDL602 series uses synchronous rectification at an operating frequency of 3.0MHz. The XDL601/XDL602 series uses HiSAT-COT (*) synchronous rectification. HiSAT-COT+PWM control (XDL601) or HiSAT-COT+automatic PWM/PFM switching control (XDL602) can be selected.

The series have a high speed soft-start as fast as 0.3ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.0V or lower. When CE=Low, the integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the L_X and V_{SS} pins. The power consumption will be less than 1.0μA.

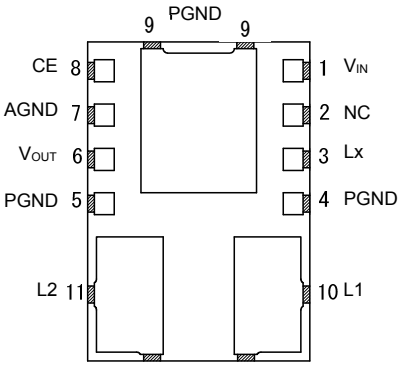
XDL601/XD602 series employ the wettable flank plated packaging. This provides a visual indicator of solderability and lowers the inspection time.

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

Features

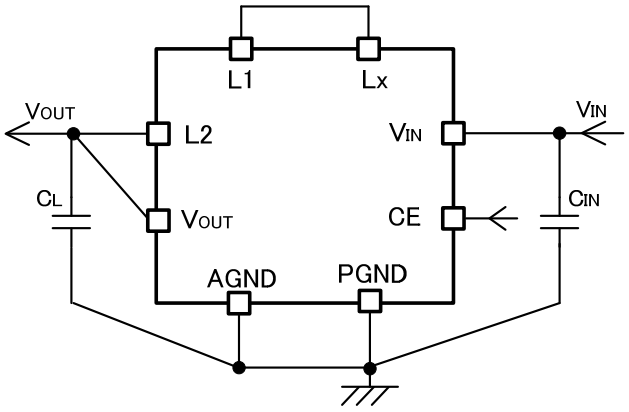
Input Voltage:	2.5V～5.5V
Output Voltage:	0.8V, 1.0V, 1.1V, 1.2V, 1.25V, 1.3V, 1.35V, 1.5V, 1.8V, 2.5V, 3.0V, 3.3V
Oscillation Frequency:	3.0MHz
Output Current:	1.5A
Efficiency:	93% (V_{IN}=5.0V,V_{OUT}=3.3V/500mA)
Control Methods:	HiSAT-COT 100% Duty Cycle HiSAT-COT+PWM (XDL601) HiSAT-COT+PWM/PFM (XDL602)
Circuit Protection:	Thermal Shut Down Current Limit Circuit (Drop) Short Circuit Protection (Latch)
Functions:	Soft-start Circuit Built-in UVLO C_L Discharge
Output Capacitor:	Low ESR Ceramic Capacitor
OperatingAmbient Temperature:	-40℃～+105℃
Package:	DFN3625-11A (with Wettable Flanks)
Environmental Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration

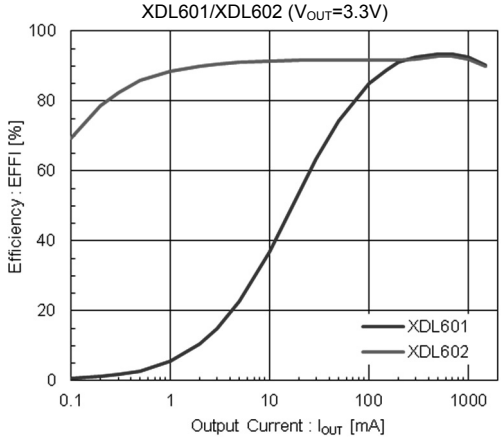


DFN3625-11A
(BOTTOM VIEW)

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XDL601①②③④⑤⑥-⑦ PWM control
XDL602①②③④⑤⑥-⑦ PWM/PFM Automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A B	Refer to Selection Guide
②③	Output Voltage	08,10,11,12,1C 13,1D,15,18 25,30,33 (*1)	Output Voltage options e.g.)1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V Increments: 0.05=A,0.15=B,0.25=C,0.35=D,0.45=E,0.55=F,0.65=H, 0.75=K,0.85=L,0.95=M
④	Oscillation Frequency	3	3.0MHz
⑤⑥-⑦(*2)	Package (Order Unit)	62-Q	DFN3625-11A (3,000pcs/Reel)

(*1) Contact Torex sales representatives for other voltages. Product selections from 0.8V to 3.6V are available.
(*2) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	C_L AUTO-DISCHARGE	LATCH or SHORT PROTECTION	UVLO	CHIP ENA-BLE	CURRENT LIMIT	SOFT-START	THERMAL SHUTDOWN
A	Fixed	No	No	Yes	Yes	Yes	Fixed	Yes
B	Fixed	Yes	Yes	Yes	Yes	Yes	Fixed	Yes

XD9260/XD9261 Series

1.5A HiSAT-COT® Control, Synchronous Step-Down DC/DC Converters

AEC-Q100 Grade2

General Description

The XD9260/XD9261 series is a group of synchronous-rectification type DC/DC converters with a built-in P-channel MOS driver transistor and N-channel MOS switching transistor, designed to allow the use of ceramic capacitors. Output voltage is internally set in a range from 0.8V to 3.6V (2.0%) increments of 0.05V. The device provides a high efficiency, stable power supply with an output current of 1.5A to be configured using only a coil and two capacitors connected externally. Oscillation frequency is set to 1.2MHz or 3MHz can be selected for suiting to your particular application. As for operation mode HiSAT-COT (*) control excellent in transient response , the XD9260 series is PWM control, the XD9261 series is automatic PWM/PFM switching control, allowing fast response, low ripple and high efficiency over the full range of loads (from light load to heavy load).

During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0 μA or less. As for the soft-start function as fast as 0.30ms in typical for quick turn-on. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel MOS driver transistor is forced OFF when input voltage becomes 2.0V or lower. The B types integrate C_L High Speed discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge.

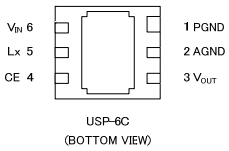
Package USP-6C is available.

(*) HiSAT-COT is a proprietary high-speed transient response technology which Torex developed and the DC/DC converters with HiSAT-COT technology are ideal for LSI's that require high precision and high stability power supply voltage.

Features

Input Voltage Range:	2.7V～5.5V (Absolute Max. Rating: 6.2V)
Output Voltage Range:	0.8V～3.6V (±2.0%)
Quiescent Current:	25 μA(f_{OSC} = 3MHz)
Output Current:	1.5A
Oscillation Frequency:	1.2MHz, 3MHz
Efficiency:	90% (V_{IN}=3.7V, V_{OUT}=1.8V, I_{OUT}=200mA)
Control Methods:	HiSAT-COT Control 100% Duty Cycle PWM Control (XD9260) PWM/PFM Auto (XD9261)
Protection Circuits:	Thermal Shutdown Current Limit (Pendent character) Short Circuit Protection (Type B)
Functions:	Soft-start UVLO C_L High Speed Discharge (Type B)
Capacitor:	Ceramic Capacitor
Operating Ambient Temperature:	- 40℃ ～ + 105℃
Packages:	USP-6C
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration

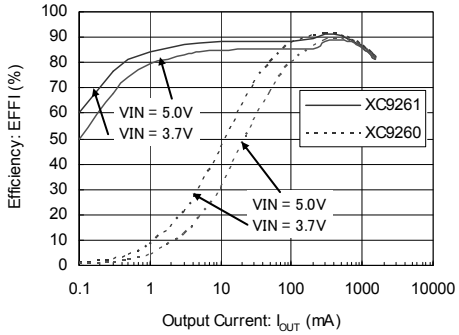


USP-6C
(BOTTOM VIEW)

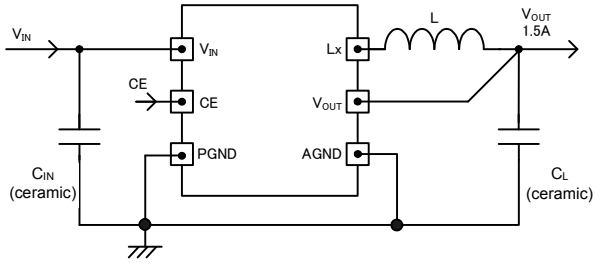
Typical Performance Characteristics

XD9260A18D / XD9261A18D

L = LQM2MPN1R0MGH(1.0 μH)
C_{IN}=10 μF(GRM155R61A106M) C_L=10 μF(GRM155R61A106M)



Typical Application Circuit



Ordering Information

XD9260①②③④⑤⑥-⑦ PWM control
XD9261①②③④⑤⑥-⑦ PWM/PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	Refer to [Selection Guide]
		B	
②③	Output Voltage	08～36	Output voltage options e.g. 1.2V → ②=1, ③=2 1.25V → ②=1, ③=C 0.05V increments : 0.05=A, 0.15=B, 0.25=C, 0.35=D, 0.45=E, 0.55=F, 0.65=H, 0.75=K, 0.85=L, 0.95=M
④	Oscillation Frequency	C	1.2MHz
		D	3MHz
⑤⑥-⑦(*1)	Package (Order Unit)	ER-Q	USP-6C (3,000pcs/Reel)

(*1) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	OUTPUT VOLTAGE	C_L AUTO-DISCHARGE	SHORT PROTECTION (LATCH)	UVLO
A	Fixed	No	No	Yes
B	Fixed	Yes	Yes	Yes

TYPE	CHIP ENABLE	CURRENT LIMIT	SOFT-START TIME	THERMAL SHUTDOWN
A	Yes	Yes	Fixed	Yes
B	Yes	Yes	Fixed	Yes

*GreenOperation-compatible

XD9242/XD9243 Series

2A Synchronous Step-Down DC/DC Converters

AEC-Q100 Grade3

General Description

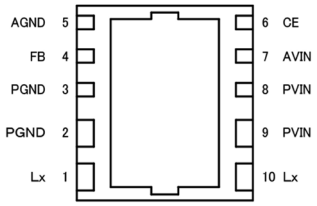
The XD9242/XD9243 series is a group of synchronous-rectification step-down DC/DC converters with a built-in 0.11Ω (TYP.) P-ch MOS driver transistor and 0.12Ω (TYP.) N-ch MOS switching transistor, designed to allow the use of ceramic capacitors. The small on-resistances of these two internal driver transistors enable a high efficiency, stable power supply with an output current up to 2A. The XD9242/XD9243 series has operating voltage range of 2.7V~6.0V and a 0.8V (±2.0%) reference voltage, and using externally connected resistors, the output voltage can be set freely from 0.9V. With an internal switching frequency of 1.2MHz or 2.4MHz, small external components can be used.

The XD9242 series is PWM control, and the XD9243 series is PWM/PFM, which automatically switches from PWM to PFM during light loads and provides high efficiency, high load response, low voltage ripple, can be achieved over a wide range of load conditions. The series have a high speed soft-start as fast as 1ms in typical for quick turn-on. It's suitable for large-current application due to limit current is configured 4.0A in typical. During stand-by, all circuits are shutdown to reduce current consumption to as low as 1.0μA or less. The integrated C_L discharge function which enables the electric charge at the output capacitor C_L to be discharged via the internal discharge switch located between the L_X and V_{SS} pins. Due to C_L discharge function, malfunction on L_X is prevented when Stand-by mode. With the built-in UVLO (Under Voltage Lock Out) function, the internal P-channel driver transistor is forced OFF when input voltage becomes 2.5V or lower. The series are available in USP-10B package.

Features

Driver Transistor: 0.11Ω P-ch Driver Transistor
0.12Ω N-ch Switching Transistor
Input Voltage Range: 2.7V ~ 6.0V
(Absolute Max. Rating: 7.0V)
Output Voltage Setting: 0.9V ~ V_{IN}
FB Voltage: 0.8V±2.0%
High Efficiency: 95% (V_{IN}=5.0V, V_{OUT}=3.3V)
Output Current: 2.0A
Oscillation Frequency: 1.2MHz (±15%), 2.4MHz (±15%)
Max. Duty Cycle: 100%
Functions: Soft-Start Circuit Built-in
C_L Discharge
Current Limit Circuit (automatic return)
Thermal Shutdown
UVLO
Output Capacitor: Low ESR Ceramic Capacitor
Control Methods: PWM (XD9242)
PWM/PFM Auto (XD9243)
Operating Ambient Temperature: -40°C ~ +85°C
Package: USP-10B
Environmentally Friendly: EU RoHS Compliant, Pb Free

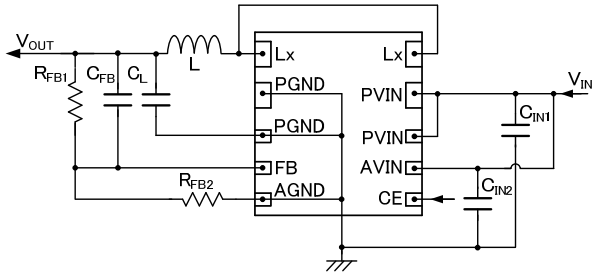
Pin Configuration



USP-10B
(BOTTOM VIEW)

Typical Application Circuit

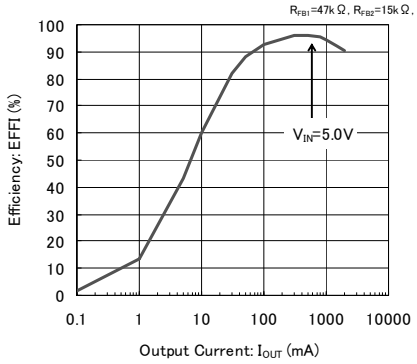
XD9242/XD9243 Series (USP-10B)



Typical Performance Characteristics

XD9242B08C

L=4.7μH(SLF7055), C_{IN1}=20μF(LMK212ABJ106KGx2)
C_{IN2}=1μF(LMK107BJ105KAx1), C_L=20μF(LMK212ABJ106KGx2)
R_{FB1}=47kΩ, R_{FB2}=15kΩ, C_{FB}=330pF



Ordering Information

XD9242①②③④⑤⑥-⑦ Fixed PWM control
XD9243①②③④⑤⑥-⑦ PWM / PFM automatic switching control

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Functional Selection	B	With C_L Discharge
②③	Output Voltage	08	Reference Voltage is fixed at 0.8V
④	Oscillation Frequency	C	1.2MHz
		D	2.4MHz
⑤⑥-⑦(*1)	Package (Order Unit)	DR-Q	USP-10B (3,000pcs/Reel)(*2)

(*1) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.
(*2) USP-10B reels are shipped in a moisture-proof packing.

XD6506 Series

Ultra-Low Quiescent Current Voltage Regulator (with Stand-by Function)

AEC-Q100 Grade2

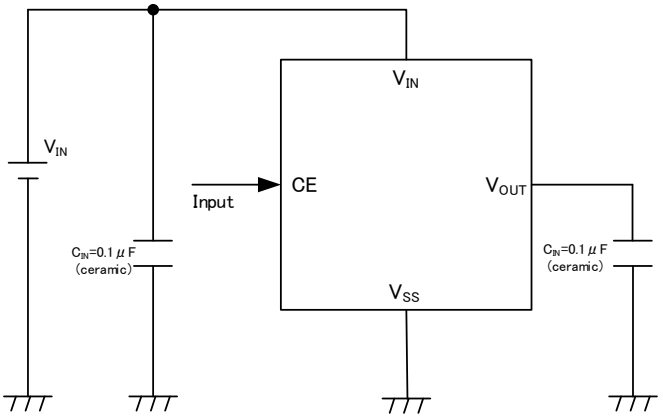
General Description

The XD6506 series are positive voltage LDO regulators manufactured using CMOS processes. The series achieves Ultra low supply current, 0.8 μ A (TYP.) and consists of a reference voltage source, an error amplifier, a current fold-back circuit, and a phase compensation circuit plus a driver transistor.
The output voltage is selectable in 0.1V increments within the range of 1.2V to 5V using laser trimming technologies.
The series is also compatible with low ESR ceramic capacitors, which give added output stability.
The current limiter's fold-back circuit also operates as a short protect for the output current limiter and the output pin.
Furthermore, the CE function allows the output of the regulator to be turned off, resulting in greatly reduced power consumption.

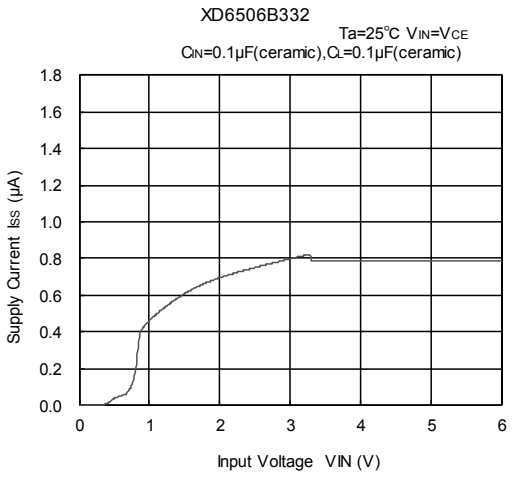
Features

Maximum Output Current: 150mA
Low Power Consumption: 0.8 μ A
Stand-by Current: Less than 0.1 μ A
Dropout Voltage: 360mV@I_{OUT}=100mA (V_{OUT}=3.3V)
Operating Input Voltage: 1.5V ~ 6.0V
Output Voltage Range: 1.2V~5.0V(0.1V Step)
Output Accuracy: ±2.0%(1.5V＜V_{OUT}≦5.0V)
±30mA(1.2≦V_{OUT}≦1.5V)
Protection function: Current limit Circuit
Low ESR Capacitor Compatible: Ceramic Capacitor Compatible
Operating Temperature Range: -40℃～+105℃
Packages: SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XD6506①②③④⑤⑥-⑦(*1)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	TYPE	B	Refer to Selection Guide
②③	Output Voltage	12~50	e.g. 3.3V ⇒ 33, 5.0V ⇒ 50
④	Output Voltage Accuracy	2	±2% (V_{OUT}≧1.5V) ±0.03V (V_{OUT}＜1.5V)
⑤⑥-⑦(*1)	Package (Order Unit)	MR-Q	SOT-25 (3,000pcs/Reel)

(*1) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.

XD6216 Series

28V Low Power Consumption 150mA Voltage Regulators (with Stand-by Function)

AEC-Q100 Grade2

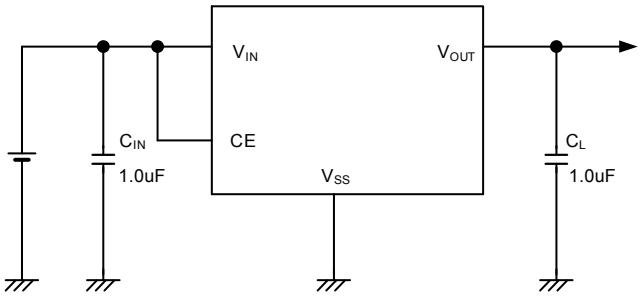
General Description

XD6216 series are positive voltage regulator ICs with 28V of operation voltage. The series consists of a voltage reference, an error amplifier, a current limiter, a thermal shutdown circuit and a phase compensation circuit plus a driver transistor.
The output voltage is selectable in 0.1V increments within the range of 1.8V to 12V using laser trimming technologies.
The output stabilization capacitor (C_L) is also compatible with low ESR ceramic capacitors.
The over current protection circuit and the thermal shutdown circuit are built-in. These two protection circuits will operate when the output current reaches current limit level or the junction temperature reaches temperature limit level.
The CE function enables the output to be turned off and the IC becomes a stand-by mode resulting in greatly reduced power consumption.

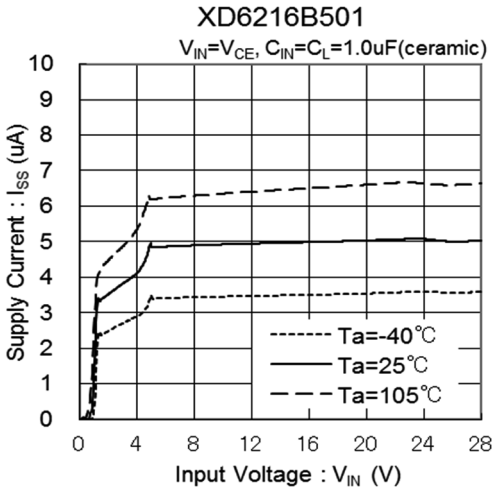
Features

Max Output Current: 150mA (V_{IN}=V_{OUT}+3.0V)
Low Power Consumption: 5μA
Stand-by Current: Less than 0.1μA
Dropout Voltage: 190mV@I_{OUT}=20mA (V_{OUT}=5.0V)
Input Voltage Range: 2.0V～28.0V
Output Voltage Range: 1.8V～12.0V (0.1V Step)
Fixed Output Accuracy: ±1% (V_{OUT}≧2.0V)
±20mV (V_{OUT}≦1.9V)
High Ripple Rejection: 30dB@1kHz
Built–in Protection: Current Limit Circuit
Thermal Shutdown Circuit
Low ESR Capacitor: Ceramic Capacitor Compatible
Operating Ambient Temperature: -40℃～+105℃
Package: SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Typical Application Circuit



Typical Performance Characteristics



Ordering Information

XD6216①②③④⑤⑥-⑦(*1)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	TYPE	B	Refer to Selection Guide
②③	Output Voltage	18～C0	For the voltage within 1.8V~9.9V (0.1V increments); e.g. 2.5V ⇒ 25, 5.0V ⇒ 50 For the voltage within 10.0V~12.0V (0.1V increments); e.g. 10.6V ⇒ A6, 11.2V ⇒ B2, 12.0V ⇒ C0
④	Output Voltage Accuracy	1	±1%
⑤⑥-⑦(*1)	Package (Order Unit)	MR-Q	SOT-25 (3,000pcs/Reel)

(*1) The “-Q” suffix denotes “AEC-Q100” and “Halogen and Antimony free” as well as being fully EU RoHS compliant.

XD6133 Series

Capacitor Delay Type Voltage Detectors with Sense Pin Isolation

AEC-Q100 Grade1

General Description

The XD6133 series are ultra-small delay capacitor adjustable type voltage detectors that have high accuracy and sense pin isolation. High accuracy and a low supply current are achieved by means of a CMOS process, a highly accurate reference power supply, and laser trimming technology.

The sense pin is isolated from the power input pin to enable monitoring of the voltage of another power supply. Output can be maintained in the detection state even if the voltage of the power supply that is monitored drops to 0V. The sense pin is also suitable for detecting high voltages, and the detection and release voltage can be set as desired using external resistors.

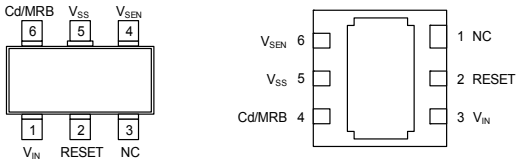
An internal delay circuit is also provided. By connecting a capacitor to the Cd/MRB pin, any release delay time and detect delay time can be set, and the pin can also be used as a manual reset pin.

Features

Operating Ambient Temperature:	-40℃～+125℃
Operating Voltage Range:	1.6V～6.0V (Absolute Max. Rating: 7.0V)
Detect Voltage Range (standard):	1.3V, 1.6V, 2.2V, 2.3V, 2.4V, 2.9V, 3.0V, 3.1V, 4.4V, 4.5V, 4.6V
Detect Voltage Range (option):	1.0V～5.0V
Detect Voltage Accuracy:	±18mV (V_{DF}＜1.5V)
(Ta=25℃)	±1.2% (1.5V≦V_{DF}≦3.0V) ±1.5% (3.1V≦V_{DF}≦5.0V)
Detect Voltage Accuracy:	±36mV (V_{DF}＜1.5V)
(Ta=-40～125℃)	±2.7% (1.5V≦V_{DF}≦3.0V) ±3.0% (3.1V≦V_{DF}≦5.0V)
Temperature Characteristics:	±50ppm/℃ (TYP.)
Hysteresis Width:	V_{DF}×5.0% (TYP.)
Low Supply Current:	1.28μA (TYP.) V_{IN}=1.6V (At detection) 1.65μA (TYP.) V_{IN}=6.0V (At release)
Manual Reset Function:	Yes
Output Type:	CMOS or Nch open drain
Output Logic:	H level or L level at detection
Delay Capacitance Pin:	Release delay / detection delay can be set in 5 time ratio options
Packages:	USP-6C,SOT-26
Environmentally Friendly:	EU RoHS compliant, Pb free

Pin Configuration

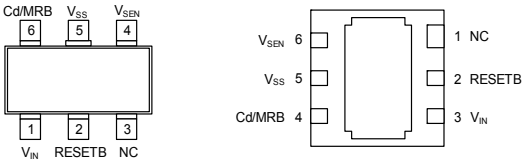
●Type A/B/C/D/L



SOT-26 (TOP VIEW)

USP-6C (BOTTOM VIEW)

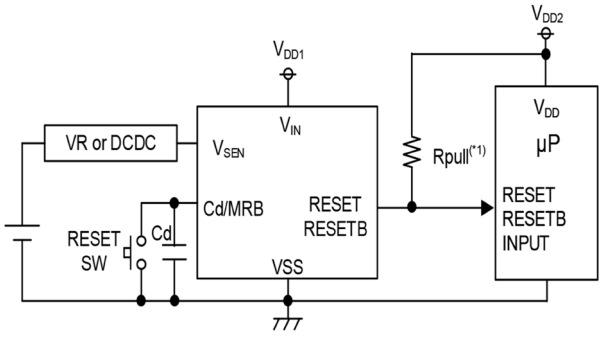
●Type E/F/H/K/M



SOT-26 (TOP VIEW)

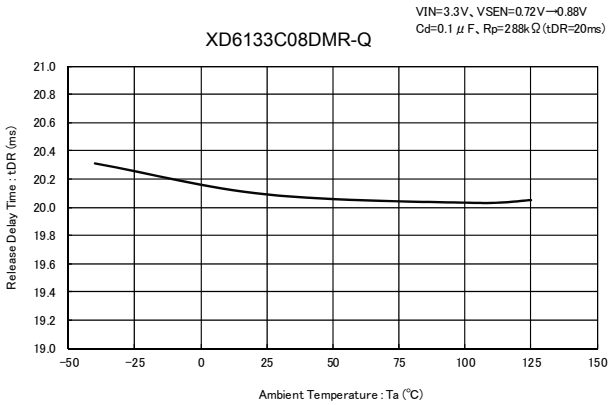
USP-6C (BOTTOM VIEW)

Typical Application Circuit



(*1.Unused for the CMOS output products)

Typical Performance Characteristics



Ordering Information

XC6133①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	Nch open drain output
②③	Detect Voltage	13, 16, 22, 23, 24, 29, 30, 31, 44, 45, 46	e.g. 1.3V → ②=1, ③=3
④	Type	A～K	Refer to [Selection Guide]
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-Q	SOT-26 (3,000pcs/Reel)
		ER-Q	USP-6C (3,000pcs/Reel)

(*1) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	RESET/RESETB OUTPUT	DELAY (Rp:Rn)		HYSTERESIS
A	Active High(*2)	1:0	144kΩ:0Ω	5.0%(TYP.)
B	↑	1:0.125	144kΩ:18kΩ	↑
C	↑	1:1	144kΩ:144kΩ	↑
D	↑	2:1	288kΩ:144kΩ	↑
L	↑	0.076:1	11kΩ:144kΩ	↑
E	Active Low(*2)	1:0	144kΩ:0Ω	↑
F	↑	1:0.125	144kΩ:18kΩ	↑
H	↑	1:1	144kΩ:144kΩ	↑
K	↑	2:1	288kΩ:144kΩ	↑

(*2) "Active High" is H level when detection occurs, and "Active Low" is L level when detection occurs.

XD6132 Series

RoHS Halogen Antimony FREE

Delay Capacitor Adjustable Voltage Detectors with Sense Pin Isolation, Surge Voltage Protection and Hysteresis External Adjustment

AEC-Q100 Grade1

General Description

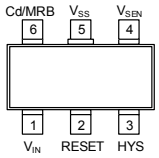
The XD6132 series are ultra-small delay capacitor adjustable type voltage detectors that have high accuracy and sense pin isolation. High accuracy and a low supply current are achieved by means of a CMOS process, a highly accurate reference power supply, and laser trimming technology.
The sense pin is isolated from the power input pin to enable monitoring of the voltage of another power supply. Output can be maintained in the detection state even if the voltage of the power supply that is monitored drops to 0V. The sense pin is also suitable for detecting high voltages, and the detection and release voltage can be set as desired using external resistors. An internal surge voltage protection circuit and an internal delay circuit are also provided.
By connecting a capacitor to the Cd/MRB pin, any release delay time and detect delay time can be set and the pin can also be used as a manual reset pin.
The HYS external adjustment pin can be used to establish a sufficient hysteresis width.

Features

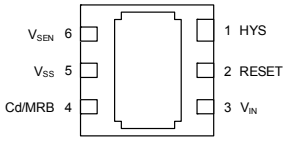
Operating Ambient Temperature:	-40℃～+125℃
Operating voltage range:	1.6V～6.0V (Absolute Max. Rating: 7.0V)
Detect voltage range:	0.8V～2.0V
Detect voltage accuracy:	±18mV(V_{DF}＜1.5V)
(Ta=25℃)	±1.2%(1.5V≦V_{DF}≦2.0V)
Detect voltage accuracy:	±36mV(V_{DF}＜1.5V)
(Ta=-40～125℃)	±2.7%(1.5V≦V_{DF}≦2.0V)
Temperature Characteristics:	±50ppm/℃(TYP.)
Hysteresis width:	V_{DF}×0.1%(TYP.)
Adjustable Pin for Hysteresis Width:	Yes
Low supply current:	1.28μA(TYP.) V_{IN}=1.6V(At detection) 1.65μA(TYP.) V_{IN}=6.0V(At release)
Manual reset function:	Yes
Output type:	CMOS or N-ch open drain
Output logic:	H level or L level at detection
Delay capacitance pin:	Release delay / detection delay can be set in 5 time ratio options
Sense pin:	Includes a surge voltage protection function
Packages:	USP-6C,SOT-26
Environmentally Friendly:	EU RoHS compliant, Pb free

Pin Configuration

●A/B/C/D/L type

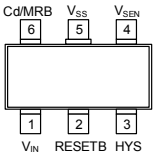


SOT-26
(TOP VIEW)

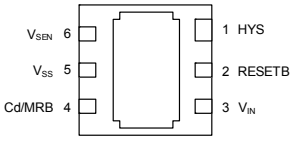


USP-6C
(BOTTOM VIEW)

●E/F/H/K/M type

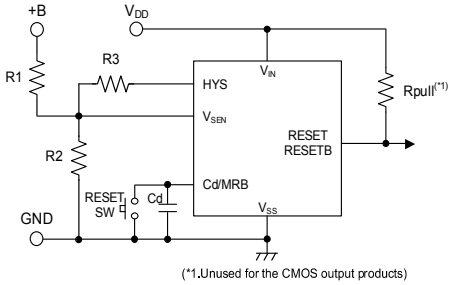


SOT-26
(TOP VIEW)



USP-6C
(BOTTOM VIEW)

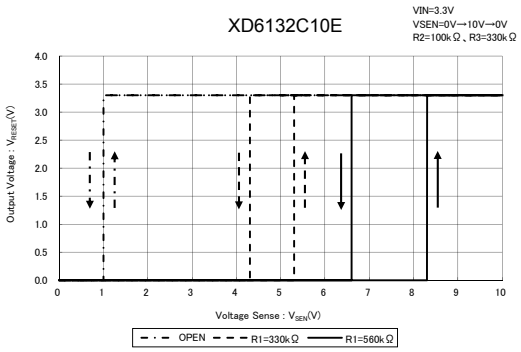
Typical Application Circuit



(*1.Unused for the CMOS output products)

Battery (+B) voltage monitoring: Detects high voltage via R1/R2 resistance division.
A hysteresis width can be added as desired by connecting R3 between the V_{SEN} and HYS pins

Typical Performance Characteristics



Ordering Information

XD6132①②③④⑤⑥-⑦

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Output Configuration	C	CMOS output
		N	N-ch open drain output
②③	Detect Voltage	08～20	e.g. 1.0V → ②=1, ③=0
④	Type	A～K	Refer to Selection Guide
⑤⑥-⑦(*1)	Packages (Order Unit)	MR-Q	SOT-26 (3,000pcs/Reel)
		ER-Q	USP-6C (3,000pcs/Reel)

(*1) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.

●Selection Guide

TYPE	RESET/RESETB OUTPUT	DELAY(Rp:Rn)		HYSTERESIS
A	Active High(*2)	1:0	144kΩ:0Ω	0.1%(TYP.)
B	↑	1:0.125	144kΩ:18kΩ	↑
C	↑	1:1	144kΩ:144kΩ	↑
D	↑	2:1	288kΩ:144kΩ	↑
L	↑	0.076:1	11kΩ:144kΩ	↑
E	Active Low(*2)	1:0	144kΩ:0Ω	↑
F	↑	1:0.125	144kΩ:18kΩ	↑
H	↑	1:1	144kΩ:144kΩ	↑
K	↑	2:1	288kΩ:144kΩ	↑

(*2) "Active High" is H level when detection occurs, and "Active Low" is L level when detection occurs.

XD6130/XD6131 Series

Watchdog Timeout Period Externally Adjustable Voltage Detector

AEC-Q100 Grade1

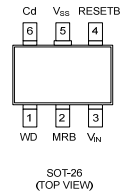
General Description

The XD6130/XD6131 series is voltage detector with watchdog function.
A release delay time and watchdog timeout period can be adjusted by one external capacitor.
The series is used for monitoring of microprocessor. When the power supply voltage reaches voltage or the pulse from Low to High is not input into a watchdog pin within watchdog timeout period, Low signal outputs from RESETB pin.
The XD6130 has manual reset function. When the manual reset pin goes low, low level signal outputs from RESETB pin and reset can be asserted at any time.
The XD6131 has ON/OFF control of the watchdog function. By setting the EN pin to low level, the watchdog function can be OFF while the voltage detector remains operation. Since the EN pin internally pulled up, the ICs can be used with there pins left open for not use.

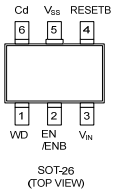
Features

Operating Voltage Range: 1.5V～6.0V
(Absolute Max. Rating: 7.0V)
Detect Voltage: 1.6V, 2.2V, 2.3V, 2.4V, 2.9V, 3.0V, 3.1V, 4.4V, 4.5V, 4.6V (±1.0%)
Hysteresis Width : V_{DFL}×5%
Low Quiescent Current: 8.1μA Detected
9.8μA Released
2.5μA Released (EN=L)
Functions: Manual Reset (XC6130)
Watchdog ON/OFF Function (XC6131)
Watchdog Timeout Period : 100ms (Cd=0.1μF)
Release Delay Time : 100ms (Cd=0.1μF) (Power-on State)
10ms (Cd=0.1μF) (After Watchdog Timeout)
Operating Ambient Temperature: -40℃～+125℃
Package: SOT-26
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

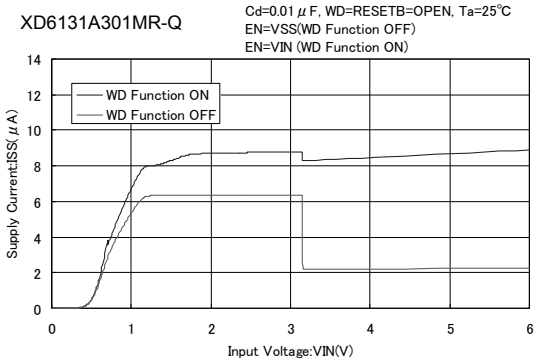


XD6130 Series



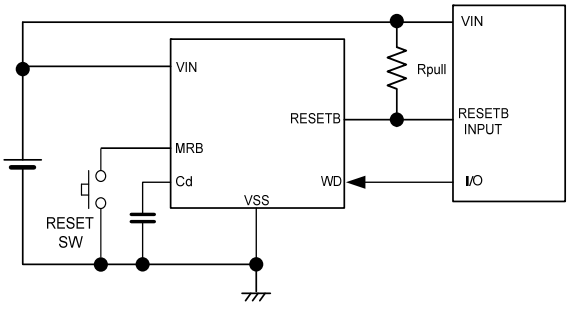
XD6131 Series

Typical Performance Characteristics

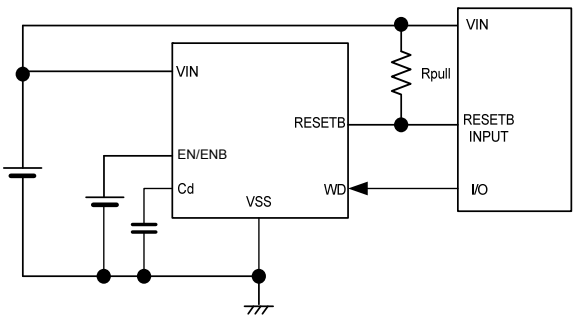


Typical Application Circuits

XD6130 Series



XD6131 Series



Ordering Information

XD6130①②③④⑤⑥-⑦ With MRB Pin (Manual Reset)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	MRB pin With pull-up resistor
②③	Detect Voltage	16～50	e.g. 1.6V → ②=1, ③=6
④	Detect Accuracy	1	±1.0%
⑤⑥-⑦ (*1)	Package (Order Unit)	MR-Q	SOT-26 (3000pcs/Reel) (*2)

(*1) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.
(*2) The SOT-26 reels are shipped in a moisture-proof packing.

XD6131①②③④⑤⑥-⑦ With EN pin (Watchdog Disable)

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Type	A	EN pin With pull-up resistor
②③	Detect Voltage	16～50	e.g. 1.6V → ②=1, ③=6
④	Detect Accuracy	1	±1.0%
⑤⑥-⑦ (*1)	Package (Order Unit)	MR-Q	SOT-26 (3000pcs/Reel) (*2)

(*1) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.
(*2) The SOT-26 reels are shipped in a moisture-proof packing.

XD6121/XD6122/XD6123/XD6124 Series

Voltage Detector with Watchdog Function and ON/OFF Control (V_{DF}=1.6V~5.0V)

AEC-Q100 Grade3

General Description

The XD6121/XD6122/XD6123/XD6124 series are groups of high-precision, low current consumption voltage detectors with watchdog functions incorporating CMOS process technology. The series consist of a reference voltage source, delay circuit, comparator, and output driver. With the built-in delay circuit, the XD6121/XD6122/XD6123/XD6124 series' ICs do not require any external components to output signals with release delay time. The output type is VDFL low when detected. With the XD6121/XD6122/XD6123/XD6124 series' ICs, the EN/ENB pin can control ON and OFF of the watchdog functions. By setting the EN/ENB pin to low or high level, the watchdog function can be OFF while the voltage detector remains operation. Since the EN/ENB pin of the XD6122 and XD6124 series is internally pulled up to the VIN pin or pulled down to the VSS pin, the ICs can be used with the EN/ENB pin left open, when the watchdog functions is used. The detect voltages are 1.6V, 2.2V, 2.3V, 2.4V, 2.9V, 3.0V, 3.1V, 4.4V, 4.5V, 4.6V. Six watchdog timeout period settings are available in a range from 50ms to 1.6s. Five release delay time settings are available in a range from 3.13ms to 400ms.

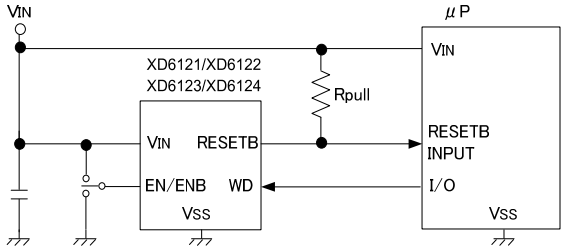
Features

Detect Voltage Range: 1.6V, 2.2V, 2.3V, 2.4V, 2.9V, 3.0V, 3.1V, 4.4V, 4.5V, 4.6V
Hysteresis Width: V_{DFL} x 5% (TYP.)
Operating Voltage Range: 1.0V ~ 6.0V (Absolute Max. Rating: 7.0V)
Detect Voltage Temperature Characteristics: +100ppm/°C (TYP.)
Output Configuration: N-channel open drain
Watchdog Pin: Watchdog input
EN/ENB Pin: The watchdog function is forced off.
Release Delay Time: 400ms, 200ms, 100ms, 50ms, 3.13ms (TYP.)
Watchdog Timeout Period: 1.6s, 800ms, 400ms, 200ms, 100ms, 50ms (TYP.)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-25
Environmentally Friendly: EU RoHS Compliant, Pb Free

Pin Configuration

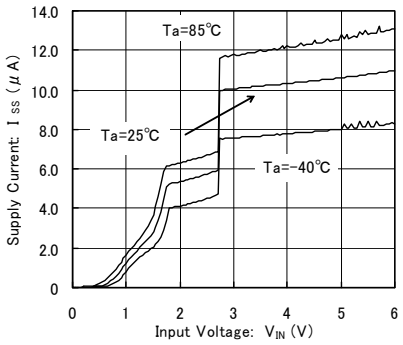
SOT-25
(TOP VIEW)

Typical Application Circuit



Typical Performance Characteristics

XD6121～XD6124 (V_{DF}=2.7V)



Ordering Information

XD6121①②③④⑤⑥-⑦: EN Pin: No Pull-Up Resistor
XD6122①②③④⑤⑥-⑦: EN Pin: Pull-Up Resistor
XD6123①②③④⑤⑥-⑦: ENB Pin: No Pull-Down Resistor
XD6124①②③④⑤⑥-⑦: ENB Pin: Pull-Down Resistor

DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①	Release Delay Time(*1)	A	3.13ms (TYP.)
		C	50ms (TYP.)
		D	100ms (TYP.)
		E	200ms (TYP.)
		F	400ms (TYP.)
②	Watchdog Timeout Period	2	50ms (TYP.)
		3	100ms (TYP.)
		4	200ms (TYP.)
		5	400ms (TYP.)
		6	1.6s (TYP.)
		7	800ms (TYP.)
③④	Detect Voltage	16, 22, 23, 24, 29, 30, 31, 44, 45, 46	ex.) 4.5V: ③⇒ 4, ④⇒ 5
⑤⑥-⑦ (*2)	Package (Order Unit)	MR-Q	SOT-25 (3,000pcs/Reel)

(*1) Please set the release delay time shorter than or equal to the watchdog timeout period.
ex.) XD6123F523MR or XD6123F623MR

(*2) The "-Q" suffix denotes "AEC-Q100" and "Halogen and Antimony free" as well as being fully EU RoHS compliant.

XC3101 Series

Ultra Small Analog Output Temperature Sensor with Alarm Output Pin

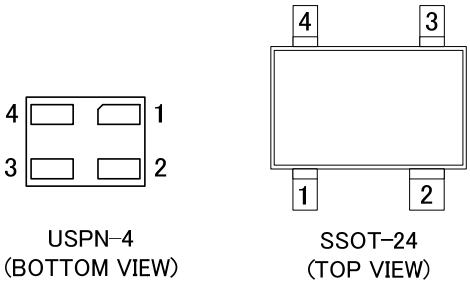
General Description

The XC3101 series is a temperature sensor IC which features ultra small, low current consumption, and high-accurate detection. It can provide both analog and alarm outputs. The alarm output configures N-channel open-drain. The device consists of a band-gap type temperature sensor, a voltage reference, a temperature setting tilt amplifier, a comparator, and various set resistors.
Alarm temperature is internally set at 70°C. When the temperature exceeds a set point, the alarm output is maintained as "Low".
When the temperature drops a pre-set hysteresis width from the set point, the alarm output is released to "High". The hysteresis width is 5°C.
An analog voltage output is provided in a high-accuracy which is guaranteed in the operating temperature range of -40°C to 100°C. An external A/D can monitor the sensing temperature.
The operating input voltage range is 2.7 to 5.5V. The small consumption current of 3.5μA (TYP.) is ideally suited for temperature detection for battery devices. The ultra small USPN-4 (1.2 x 0.9 x 0.4) package is available for the high-density board mounting in mobile device applications as well as an industry standard package SSOT-24.

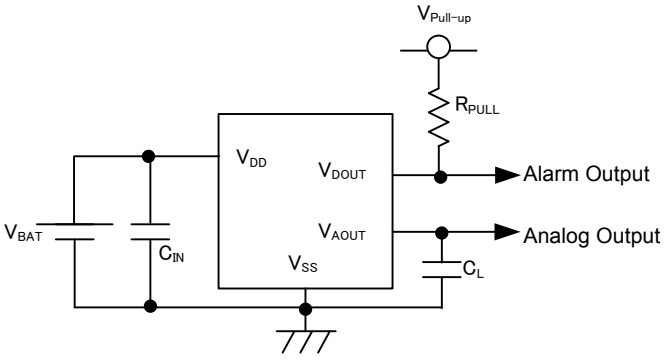
Features

Input Voltage Range:	2.7V ~ 5.5V
Analog Output Voltage:	1.600V (TYP.) @25°C 2.365V (TYP.) @-40°C 0.717V (TYP.) @100°C
Analog Output Temp. Coefficient:	-11.77mV/°C (TYP.)
Analog Output Temp. Range:	-40°C ~ +100°C
Temperature Accuracy:	±3.5°C@ T a= -40°C ~ +100°C
Alarm Temperature:	70°C ±4.5°C
Alarm Hysteresis:	5°C (TYP.)
Alarm Output Configuration:	N-channel Open-Drain
Alarm Output Logic:	Active Low Alarm
Low Quiescent Current:	3.5μA (TYP.) @25°C
Operating Ambient Temperature:	-40°C ~ +100°C
Packages:	USPN-4, SSOT-24
Environmentally Friendly:	EU RoHS Compliant, Pb Free

Pin Configuration

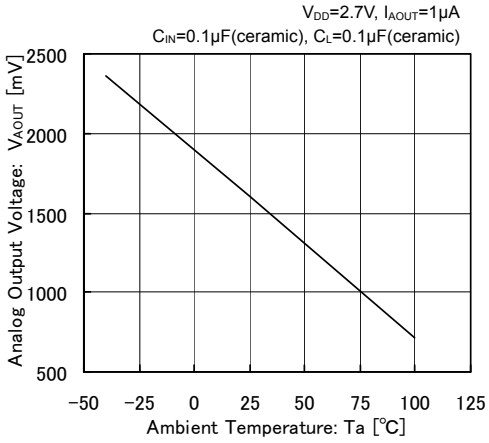


Typical Application Circuit



Typical Performance Characteristics

XC3101AC70



Ordering Information

PRODUCT NAME	ALARM TEMPERATURE (*2)	HYSTERESIS WIDTH (*3)	PACKAGE	ORDER UNIT
XC3101AC70NR-G(*1)	70°C	5°C	SSOT-24	3,000pcs/Reel
XC3101AC707R-G(*1)	70°C	5°C	USPN-4	5,000pcs/Reel

(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.
(*2) For other alarm temperature besides 70°C, please contact your local Torex sales office or representative. Optional setting range is 50°C ~ 95°C.
(*3) The hysteresis width selections are available in 5°C and 2 other optional for alarm temperature.

PRODUCT NAME	HYSTERESIS WIDTH	DESCRIPTION
XC3101AA	0°C (TYP.)	Semi-custom
XC3101AB	2.4°C (TYP.)	Semi-custom
XC3101AC	5°C (TYP.)	Standard

XC25BS8 Series

Ultra Small PLL Clock Generator ICs with Built-in Divider/Multiplier Circuits

General Description

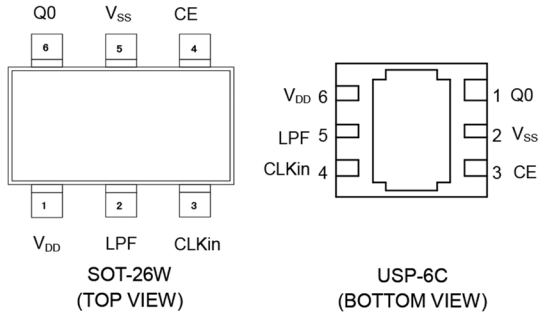
The XC25BS8 series is an ultra small PLL clock generator IC which can generate a high multiplier output up to 4095 from an input frequency as low as 8kHz. The series includes a divider circuit, phase/frequency comparator, charge pump, and VCO so it is possible to configure a fully operational circuit with a few external components like one low-pass filter capacitor. The Input divider ratio (M) can be selected from a range of 1 to 2047, the output divider ratio (N) can be selected from a range of 1 to 4095 and they are set internally by using laser timing technologies. Output frequency (fQ0) is equal to input clock frequency (f_{CLKin}) multiplied by N/M. Output frequency range is 1MHz to 100MHz. Reference clock from 8kHz to 36MHz can be input as the input clock. The IC stops operation and current drain is suppressed when a low level signal is input to the CE pin which greatly reduces current consumption and produces a high impedance output.
The setting of the input divider ratio (M), output divider ratio (N), and charge pump current (Ip) are factory fixed semi-custom. Please advise your Torex sales representative of your particular input/output frequency and supply voltage specifications so that we can see if we will be able to support your requirements. The series is available in small SOT-26W and USP-6C.

Features

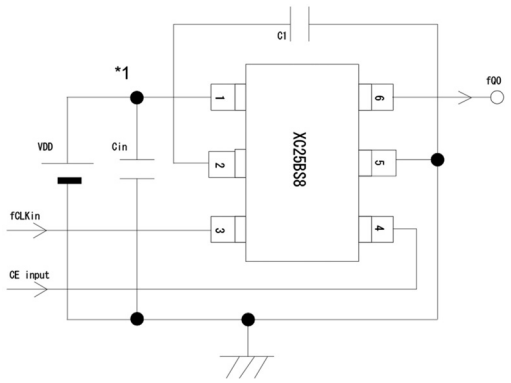
Input Frequency Range: 8kHz ~ 36MHz (*1)
Output Frequency Range: 1MHz ~ 100MHz ($f_{Q0}=f_{CLKin} \times N/M$) (*1)
Output Divider (N) Range: 1 ~ 4095 (*1)
Input Divider (M) Range: 1 ~ 2047 (*1)
Operating Voltage Range: 2.50V ~ 5.50V (*1)
(Absolute Max. Rating: 7.0V)
Low Quiescent Current: 10μA MAX. when stand-by (*2)
Operating Ambient Temperature: -40°C ~ +85°C
Packages: SOT-26W, USP-6C
Environmentally Friendly: EU RoHS Compliant, Pb Free

*1: The series are semi-custom products. Specifications for each product are limited within the above range. The input frequency range is set within ±5% of customer's designated typical frequency.
Please note that setting of your some requirements may not be possible due to the specification limits of this series.
*2: When the IC is in stand-by mode, the output becomes high impedance and the IC stops operation.

Pin Configuration



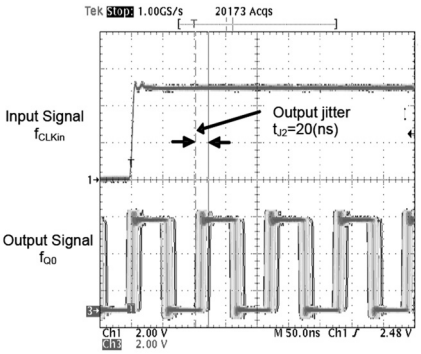
Typical Application Circuit



*1: CIN (by-pass capacitor, 0.1μF) and LPF should be connected to the IC as close as possible.

Typical Performance Characteristics

PLL Output signal jitter 2 (t_{J2}) (synchronous to an input signal)
XC25BS8001xx (610 multiplier, input 15kHz (TYP.))



Ordering Information

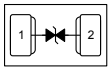
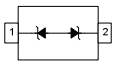
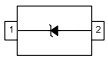
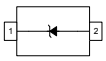
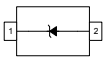
XC25BS8①②③④⑤-⑥

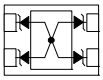
DESIGNATOR	ITEM	SYMBOL	DESCRIPTION
①②③	Product Number	001~	Serial number based on internal standards e.g. product number 001 → ①②③=001
④⑤-⑥(*1)	Packages (Order Unit)	MR-G	SOT-26W (3,000pcs/Reel)
		ER-G	USP-6C (3,000pcs/Reel)

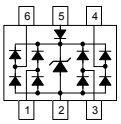
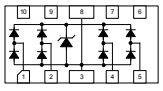
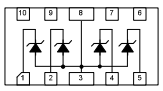
(*1) The "-G" suffix denotes Halogen and Antimony free as well as being fully EU RoHS compliant.

TVS Diodes

Comparison of Characteristics

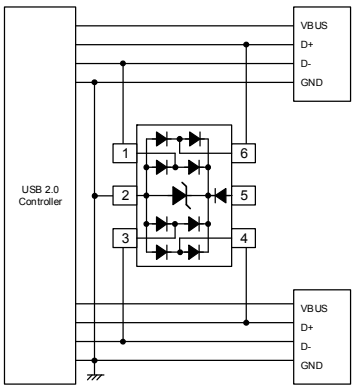
Product number	XBP06V0U25R-G	XBP1012-G	XBP1010-G	XBP1011-G	XBP1013-G
Type	Bidirectional (Single)		Unidirectional (Single)		
V_{BR} MIN. (@I_R=1mA)	6.0V	13.3V	6.2V	6.0V	6.0V
I_R MAX.	1.0μA	1.0μA	1.0μA	5.0μA	10μA
C_t (@V_R=0V,f=1MHz)	0.35pF(MAX.)	100pF(MAX.)	35pF(MAX.)	110pF(MAX.)	300pF(MAX.)
ESD Protection	15kV	8kV	8kV	25kV	25kV
Package	FBP1006	SOD-323P	SOD-923	SOD-523P	SOD-323P
Dimensions (mm)	1.0x0.6(h=0.55)	2.5x1.25(h=0.95)	1.0x0.6(h=0.45)	1.6x0.8(h=0.65)	2.5x1.25(h=0.95)
Pin Configuration					

Product number	XBP1008-G	XBP06V0U2MR-G	XBP06V4E2HR-G	XBP06V4E4GR-G	XBP06V1E4MR-G
Type	Unidirectional (Dual)			Unidirectional (Quad)	
V_{BR} MIN. (@I_R=1mA)	6.0V	6.0V	6.4V	6.4V	6.1V
I_R MAX.	20μA	1.0μA	1.0μA	1.0μA	2.5μA
C_t (@V_R=0V,f=1MHz)	1.0pF(MAX.)	0.8pF(MAX.)	40pF(TYP.)	40pF(TYP.)	170pF(TYP.)
ESD Protection	8kV	15kV	30kV	30kV	30kV
Package	SOT-23P	SOT-23	USP-3	USP-4	SOT-25
Dimensions (mm)	2.9x2.4(h=1.1)	2.9x2.8(h=1.3)	1.2x1.2(h=0.6)	1.6x1.2(h=0.6)	2.9x2.8(h=1.3)
Pin Configuration					

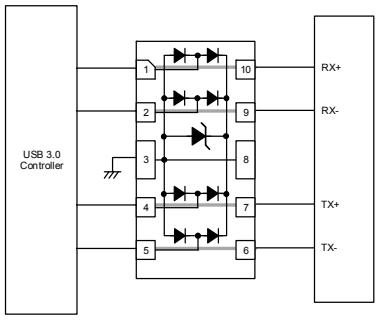
Product number		XBP15SRV05W-G	XBP14E5UFN-G	XBP141P-G
Type		Array		
V_{BR} MIN. (@I_R=1mA)		6.0V	6.0V	6.0V
I_R MAX.		5.0μA	1.0μA	1.0μA
C_t (@V_R=0V,f=1MHz)	I/O-GND	1.2pF(MAX.)	0.8pF(MAX.)	0.4pF(MAX.)
	I/O-I/O	0.6pF(MAX.)	0.4pF(MAX.)	0.2pF(TYP.)
ESD Protection		10kV	8kV	15kV
Package		SOT-26P	DFN2510-10A	DFN2510-10A
Dimensions (mm)		2.9x2.8(h=1.3)	2.5x1.0(h=0.55)	2.5x1.0(h=0.55)
Pin Configuration				

Application Circuits

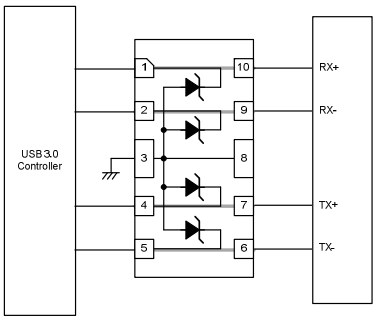
XBP15SRV05W-G



XBP14E5UFN-G



XBP141P-G



Zener Diode

Series	Nominal Zener Voltage			Zener Impedance		Max Reverce Leakage Current		Package	Pcs/Reel
	Min [V]	TYP [V]	Max [V]	ZZT@5mA(Ω)	ZZK@1mA(Ω)	IR [μA]	VR [V]		
XBZ02P0751-G	7.13	7.5	7.88	15	80	1	5	SOD-523P	5,000
XBZ02P0911-G	8.65	9.1	9.56	15	100	0.5	6	SOD-523P	5,000
XBZ02P1201-G	11.4	12	12.6	25	150	0.1	8	SOD-523P	5,000
XBZ02P3601-G	34.2	36	37.8	90	350	0.1	25.2	SOD-523P	5,000
XBZ12A120C-G	11.4	12	12.6	25	150	0.1	9.1	USP-2B02	10,000

Schottky Barrier Diode

Series	Reverse Voltage(V)	Forward Current(A)	Forward Voltage(V)	Reverse Current(mA)	Inter-Terminal Capacity(pF)	Package	Pcs/Reel
XBS013P11R-G	30	0.01	0.35	0.01	4	SOD-923	8,000
XBS013R1DR-G	30	0.1	0.46	0.0003	2	USP-2B01	10,000
XBS013S15R-G	30	0.1	0.71	0.002	6	SOD-523	3,000
XBS013S16R-G	30	0.1	0.71	0.002	6	SOD-723	3,000
XBS013S1CR-G	30	0.1	1	0.002	2	USP-2B02	10,000
XBS013V1DR-G	30	0.1	0.37	0.007	2	USP-2B01	10,000
XBS023P11R-G	30	0.2	0.5	0.1	5	SOD-523P	5,000
XBS024S15R-G	40	0.2	0.53	0.002	5	SOD-523	3,000
XBS053P11R-G	20	0.5	0.49	0.1	15	SOD-323P	5,000
XBS053V13R-G	20	0.5	0.4	0.1	12	SOD-323A	3,000
XBS053V15R-G	20	0.5	0.4	0.1	12	SOD-523	3,000
XBS104S13R-G	40	1	0.49	0.2	35	SOD-323A	3,000
XBS104S14R-G	40	1	0.49	0.2	35	SOD-123A	3,000
XBS104P11R-G	40	1	0.56	0.5	30	SOD-123P	3,000
XBS104V14R-G	40	1	0.365	2	150	SOD-123A	3,000
XBS203V19R-G	30	2	0.35	3	110	SMA-XG	2,000
XBS204V19R-G	40	2	0.46	0.1	75	SMA-XG	2,000
XBS204S19R-G	40	2	0.485	0.2	70	SMA-XG	2,000
XBS206S19R-G	60	2	0.615	0.3	45	SMA-XG	2,000
XBS303V29R-G	30	3	0.39	0.9	190	SMA-XG	2,000
XBS303V19R-G	30	3	0.355	3	385	SMA-XG	2,000
XBS304S19R-G	40	3	0.465	0.3	180	SMA-XG	2,000
XBS304F11R-G	40	3	0.45	2	120	SMA-PG	1,800
XBS306S19R-G	60	3	0.59	0.003	75	SMA-XG	2,000
XBS306P11R-G	60	3	0.75	0.1	80	SMA-PG	1,800
XBS504V1AR-G	40	5	0.49	0.1	210	SMBT	4,000
XBS506V1AR-G	60	5	0.6	0.05	150	SMBT	4,000

Fast Recovery Diode

Product	Reverse Voltage	RMS Voltage	Forward Current (Average)	Forward Voltage	Reverse Current	Reverse Recovery Time	Package	Pcs/Reel
	VRM [V]	VRMS [V]	IF(AV) [A]	VF@ (V)	IR@ (μA)	Trr [nS]		
XBF10A20S-G	200	140	1	0.95	1	35	SMAF	3,000
XBF10A40S-G	400	280	1	1.25	1	35	SMAF	3,000
XBF10A60S-G	600	420	1	1.7	1	35	SMAF	3,000
XBF20A20S-G	200	140	2	0.95	1	35	SMBF	10,000
XBF20A40S-G	400	280	2	1.25	1	35	SMBF	10,000
XBF20A60S-G	600	420	2	1.7	1	35	SMBF	10,000

Switching Diode

Product	Reverse Voltage	Forward Voltage	Forward Current	Reverce Current		Recovery time	Capacitance	Package	Pcs/Reel
	VRRM [V]	VF [V]	IF [mA]	IR [μA]	VR [V]	trr [ns]	CT [pF]		
XBW1SS400-G	80	1.2	100	0.1	80	4	0.5	SOD-523P	5,000
XBW21P0204-G	75	1.25	150	0.03	25	4	1.5	SOT-323	3,000

Bridge Diode

Product	Repetitive Peak Reverse Voltage	Forward Current	Non Continuous Forward Surge Current	Forward Voltage	Reverse Current	Package	Pcs/Reel
	VRM [V]	IF(AV) [A]	IFSM [A]	VF [V]	IR [μA]		
XBR12A6-G	600	1.5	50	1.1	5	SDIP	3,000
XBR12A8-G	800	1.5	50	1.1	5	SDIP	3,000
XBR12A10-G	1000	1.5	50	1.1	5	SDIP	3,000

Power MOS FET

N Channel

SERIES	VDS	VGS	ID	RDS(on)Max. mΩ					CissTyp.	Package	Pcs/Reel
	V	±V	A	10V	pF	2.5V	1.5V	1.2V	pF		
XP151A12A2MR-G	20	8	1		100	140			220	SOT-23	3,000
XP151A13A0MR-G	20	12	1		100	160	250		180	SOT-23	3,000
XP161A1265PR-G	30	20	1	120	170				150	SOT-89	1,000
XP161A1355PR-G	20	8	4		50	70			390	SOT-89	1,000
XP151A11B0MR-G	20	12	4		55	95			320	SOT-23	3,000
XP161A11A1PR-G	30	20	4	65	105				270	SOT-89	1,000
XP231N0201TR-G (Development)	30	20	0.15		3 (TYP)				-	SOT-23 (TO-236)	3,000
XP232N0301TR-G (Development)	30	20	0.3		1.7 (TYP)				-	SOT-23 (TO-236)	3,000
XP233N0501TR-G (Development)	30	20	0.5		0.6 (TYP)				-	SOT-23 (TO-236)	3,000
XP234N0801TR-G (Development)	30	20	0.8		0.25 (TYP)				-	SOT-23 (TO-236)	3,000
XP235N2001TR-G (Development)	30	20	2		0.08 (TYP)				-	SOT-23 (TO-236)	3,000
XP261N7002TR-G (Development)	60	20	0.15		3.5 (TYP)				-	SOT-23 (TO-236)	3,000
XP262N7002TR-G (Development)	60	20	0.3		1.5 (TYP)				-	SOT-23 (TO-236)	3,000
XP263N1001TR-G (Development)	60	20	1		0.2 (TYP)				-	SOT-23 (TO-236)	3,000

P Channel

SERIES	VDS	VGS	ID	RDS(on)Max. mΩ					CissTyp.	Package	Pcs/Reel
	V	±V	A	10V	4.5V	2.5V	1.8V	1.2V	pF		
XP152A12C0MR-G	-20	12	-0.7		300	500			180	SOT-23	3,000
XP162A12A6PR-G	-30	20	-0.7	250	450				160	SOT-89	1,000
XP152A11E5MR-G	-20	12	-2.5		170	300			310	SOT-23	3,000
XP162A11C0PR-G	-30	20	-2.5	150	280				280	SOT-89	1,000
XP202A0003MR-G	-30	20	-3	67	95				435	SOT-23	3,000
XP202A0003PR-G	-30	20	-5	59	100				450	SOT-89	1,000
XP231P0201TR-G (Development)	-30	8	-0.2	-	3200 (TYP)	-	-		-	SOT-23 (TO-236)	3,000
XP232P0501TR-G (Development)	-30	8	-0.45	-	850 (TYP)	1300 (TYP)	-		-	SOT-23 (TO-236)	3,000
XP233P1501TR-G (Development)	-30	20	-1.5	-	190 (TYP)	-	-		-	SOT-23 (TO-236)	3,000

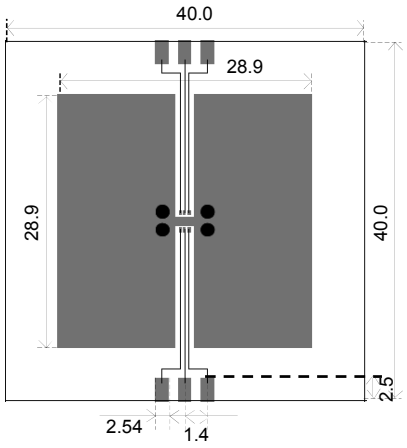
Package Power Dissipation

● CL-2025-02 Power Dissipation

Power dissipation data for the CL-2025-02 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

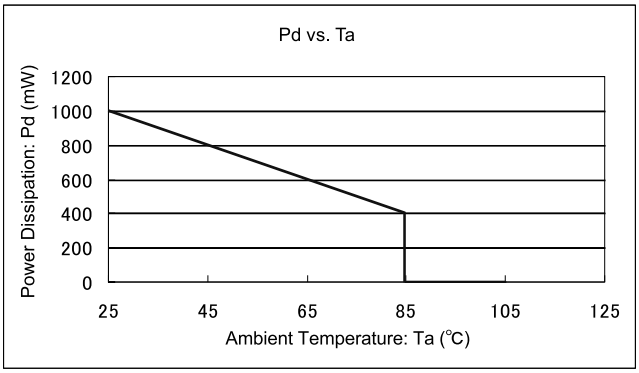


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	250	

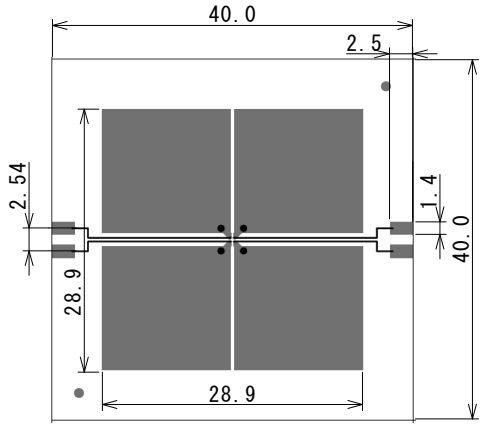


● LGA-4B01 Power Dissipation

Power dissipation data for the LGA-4B01 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition : Mount on a board
Ambient : Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the front and 50% of the back.
The copper area is divided into four block, one block is 12.5% of total.
Each terminal connects one copper block in the front and one in the back.
Material : Glass Epoxy（FR-4）
Thickness : 1.6mm
Through-hole : 4 x 0.8 Diameter

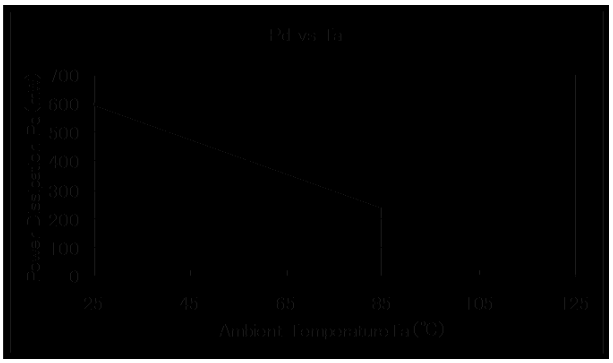


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	



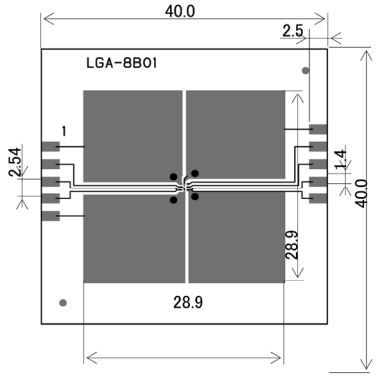
Package Power Dissipation

● LGA-8B01 Power Dissipation (105℃)

Power dissipation data for the LGA-8B01 is shown in this page. Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40mm × 40mm (1600mm^2 in one side)
Copper (Cu) traces
1st Layer : Approx 50%_Connects to lead 1/4/5/8
2nd Layer : Approx 50%_Connects to lead 1/4/5/8
3rd Layer : Approx 50%_Connects to lead 1/4/5/8
4th Layer : Approx 50%_Connects to lead 1/4/5/8
(The copper area is divided into four bloak, one block is 12.5% of total. Each terminal connects one copper block in the front and one in the back.)
Material: Glass Epoxy (FR-4)
Thickness: 1.6mm
Through-hole: 4 x 0.8 Diameter

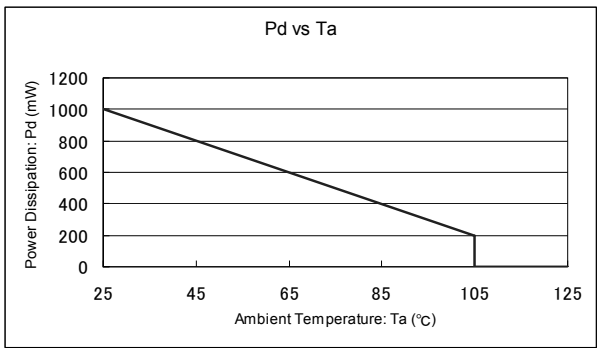


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
105	200	

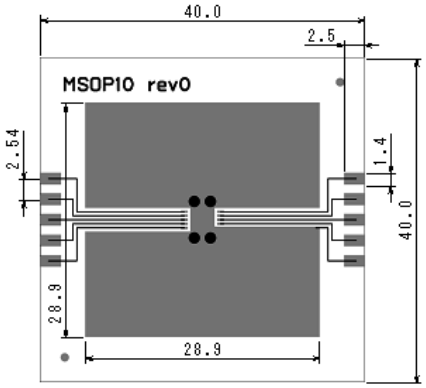


● MSOP-10 Power Dissipation

Power dissipation data for the MSOP-10 is shown in this page. The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition : Mount on a board
Ambient : Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 40mm × 40mm (1600mm^2 in one side)
1st Inner Metal Layer about 50% tied to the pin 10
2nd Inner Metal Layer does not exist
3rd Inner Metal Layer does not exist
4th Inner Metal Layer about 50% tied to the pin 10
Each pin is tied to the copper traces.
Material : Glass Epoxy (FR-4)
Thickness : 1.6mm
Through-hole : 10 x 0.8 Diameter

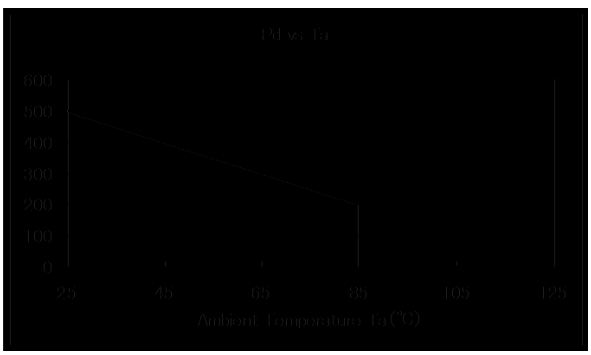


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	500	200.00
85	200	



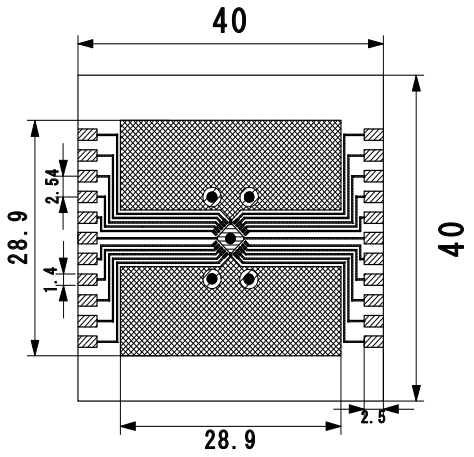
Package Power Dissipation

● QFN-20 Power Dissipation

Power dissipation data for the QFN-20 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition : Mount on a board
Ambien t: Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material : Glass Epoxy (FR-4)
Thickness : 1.6 mm
Through-hole : 5 x 0.8 Diameter

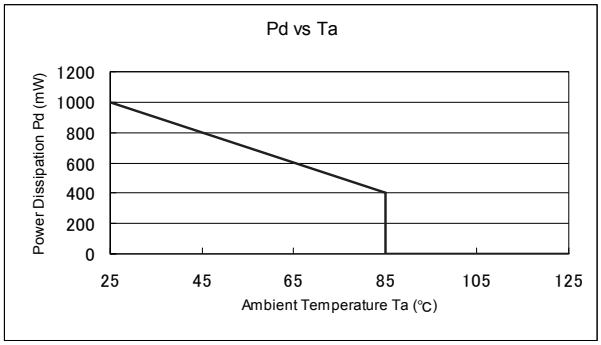


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	400	

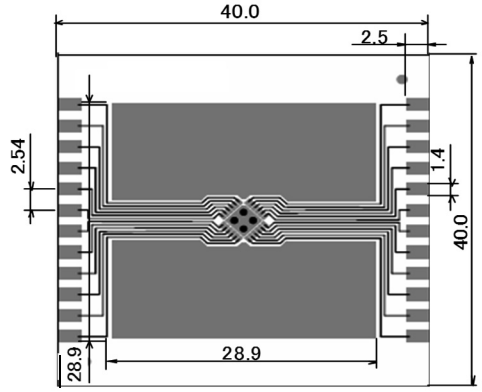


● QFN-24 Power Dissipation

Power dissipation data for the QFN-24 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions:40 x 40 mm (1600mm^2 in one side)
4Copper Layers
1st Inner metal layer about 50% is not connected to the heatsink back metal.
2nd, 3rd and 4th Inner metal layer about 50% connects to the heatsink back metal.
Material: Glass Epoxy (FR-4)
Thickness: 1.0 mm
Through-hole: 4 x 0.4 Diameter

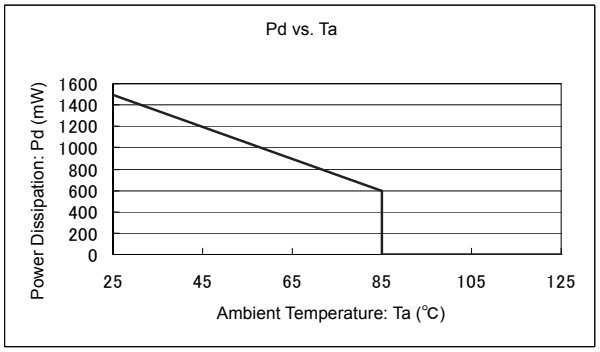


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1500	66.67
85	600	



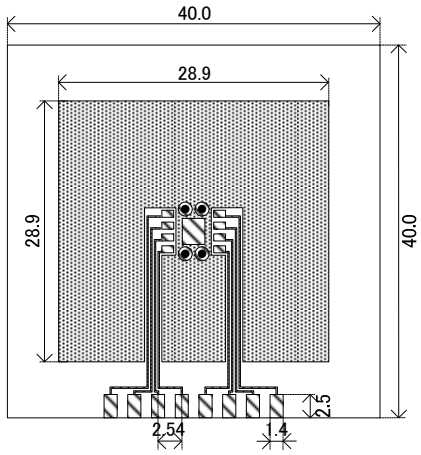
Package Power Dissipation

● SOP-8FD Power Dissipation

Power dissipation data for the SOP-8FD is shown in this page. The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition : Mount on a board
Ambient : Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6mm
Through-hole: 4 x 0.8 Diameter

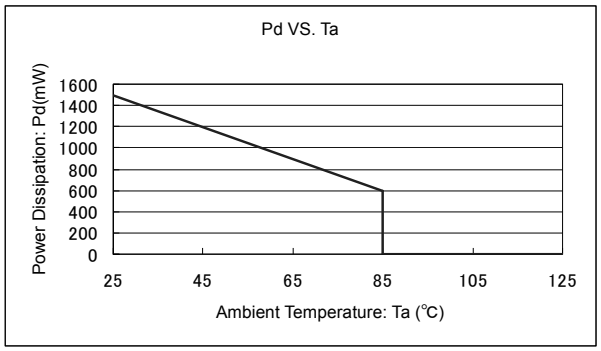


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1500	66.67
85	600	



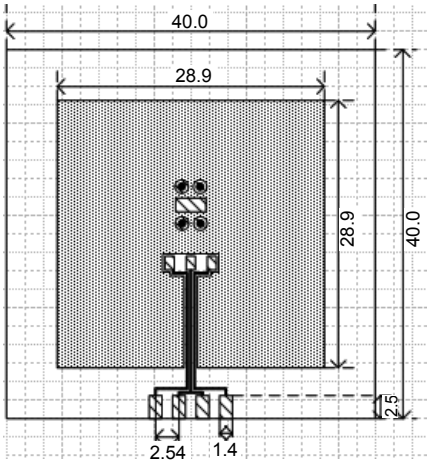
● SOT-223 Power Dissipation

Power dissipation data for the SOT-223 is shown in this page. The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

Ambient Temperature: Ta (℃)

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

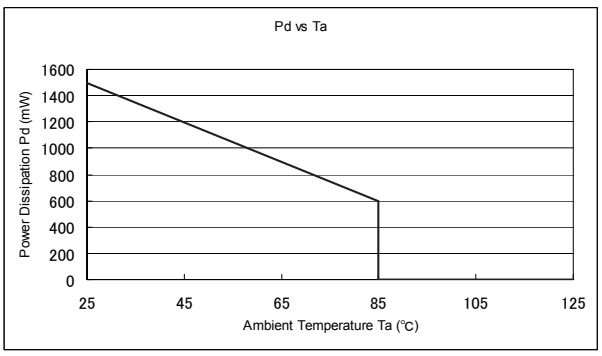


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1500	66.67
85	600	



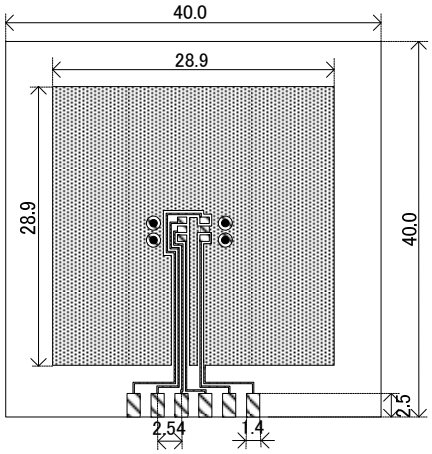
Package Power Dissipation

● SOT-23 Power Dissipation

Power dissipation data for the SOT-23 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces. (Board of SOT-26 is used)
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

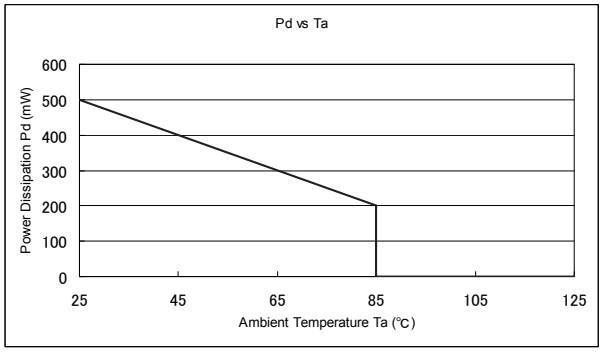


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	500	200.00
85	200	

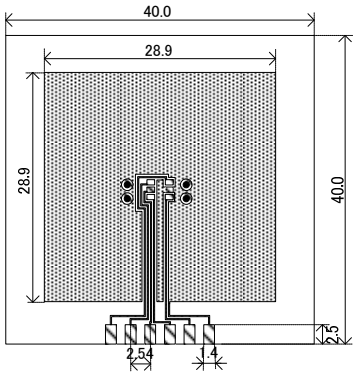


● SOT-25 Power Dissipation

Power dissipation data for the SOT-25 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces. (Board of SOT-26 is used)
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

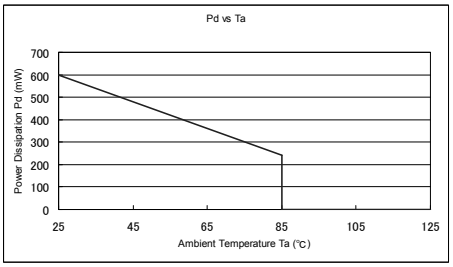


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

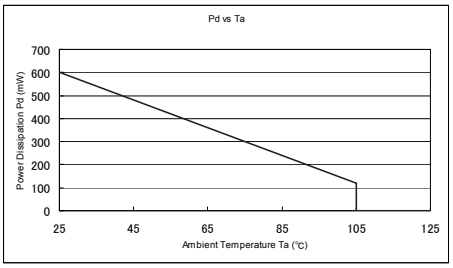
Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	



3. Power Dissipation vs. Ambient temperature (105℃)

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
105	120	



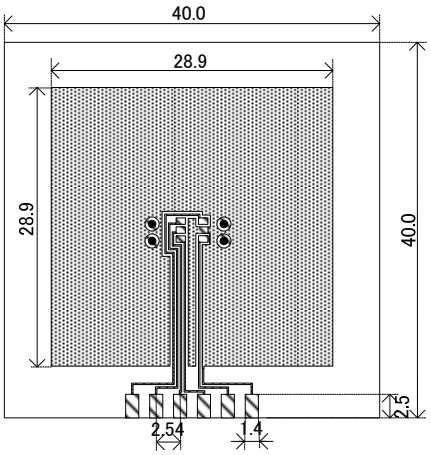
Package Power Dissipation

● SOT-26 Power Dissipation

Power dissipation data for the SOT-26 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameters

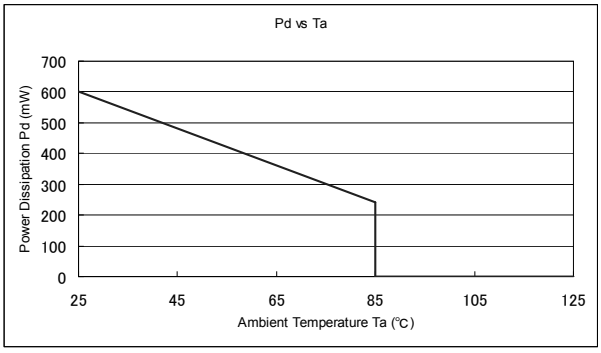


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	

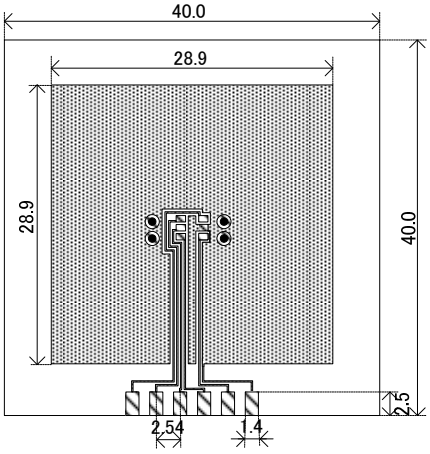


● SOT-26W Power Dissipation

Power dissipation data for the SOT-26W is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameters

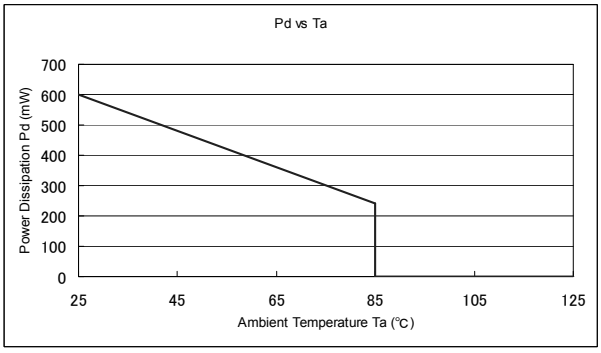


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	



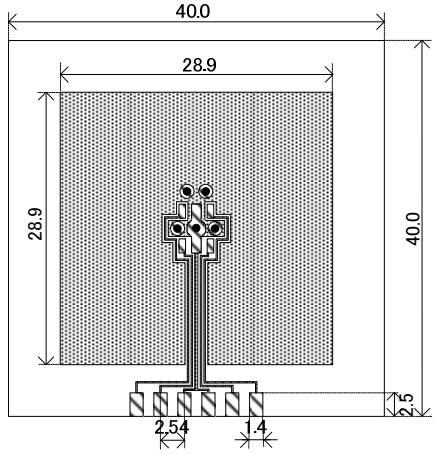
Package Power Dissipation

● SOT-89 Power Dissipation

Power dissipation data for the SOT-89 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 5 x 0.8 Diameter

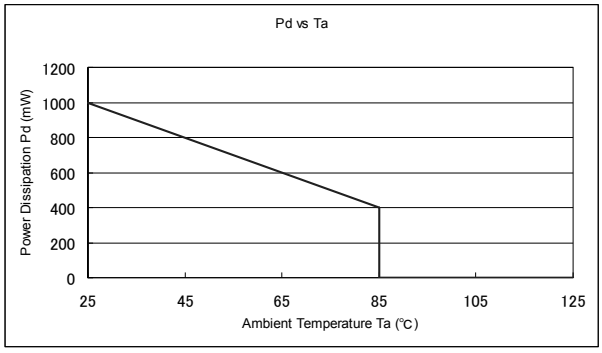


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	400	

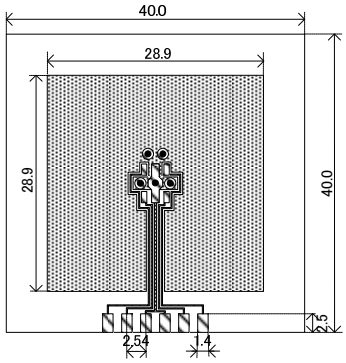


● SOT-89-5 Power Dissipation

Power dissipation data for the SOT-89-5 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 5 x 0.8 Diameter

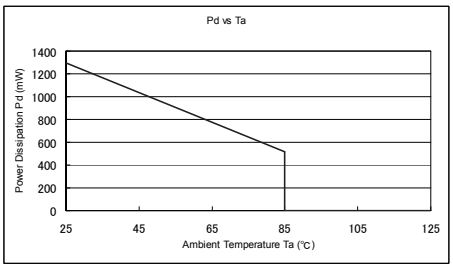


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

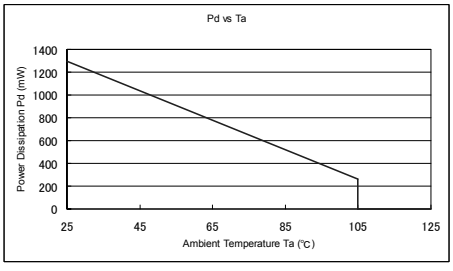
Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1300	76.92
85	520	



3. Power Dissipation vs. Ambient temperature (105℃)

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1300	76.92
105	260	



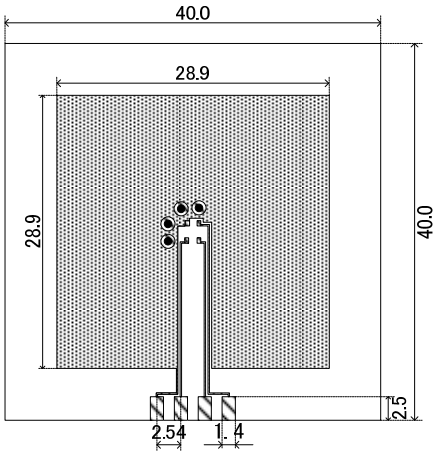
Package Power Dissipation

● SSOT-24 Power Dissipation

Power dissipation data for the SSOT-24 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

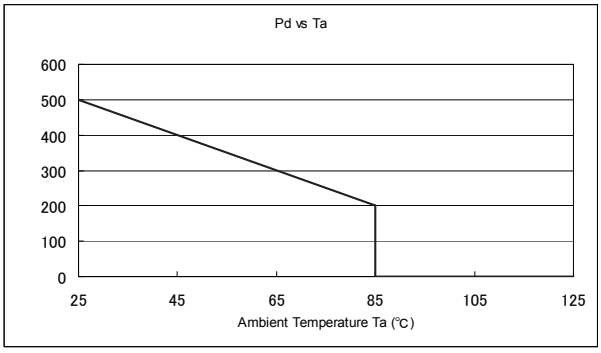


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	500	200.00
85	200	

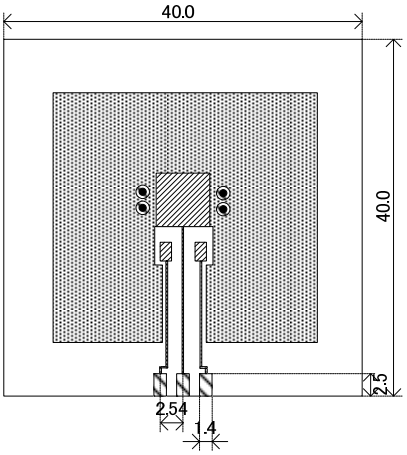


● TO-252 Power Dissipation

Power dissipation data for the TO-252 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Second pin is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

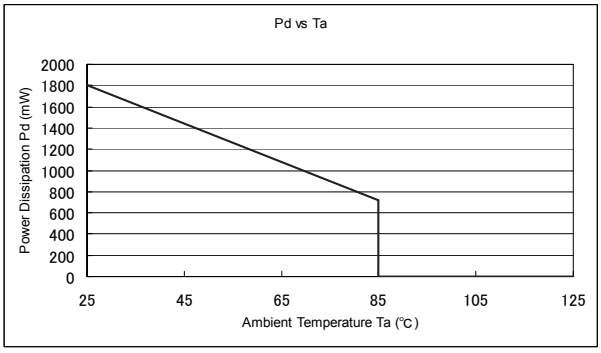


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1800	55.56
85	720	



Package Power Dissipation

● USP-2B01 Power Dissipation

Power dissipation data for the USP-2B01 is shown in this page. The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

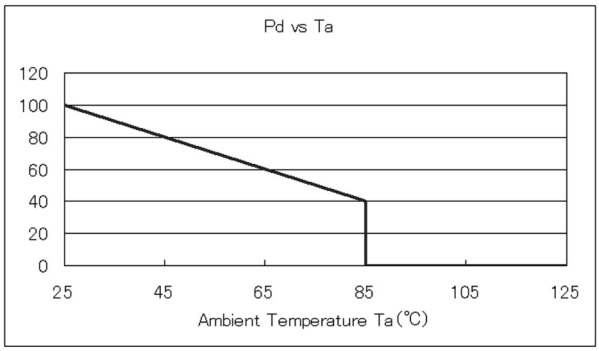
1. Measurement Condition

Condition : Mount on a board
Ambient : Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 114.3mm×76.2mm
Copper (Cu) traces occupy 74.2mm x 74.2mm of the board area in back faces.
Material : Glass Epoxy (FR-4)
Thickness : 1.6mm

2. Power Dissipation vs. Ambient temperature

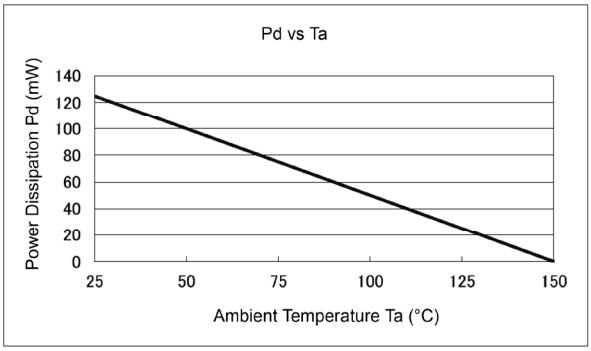
Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	100	1000.00
85	40	



Board Mount (Tj max = 150℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	125	1000.00
85	65	
150	0	



● USP-2B02 Power Dissipation

Power dissipation data for the USP-2B02 is shown in this page. The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

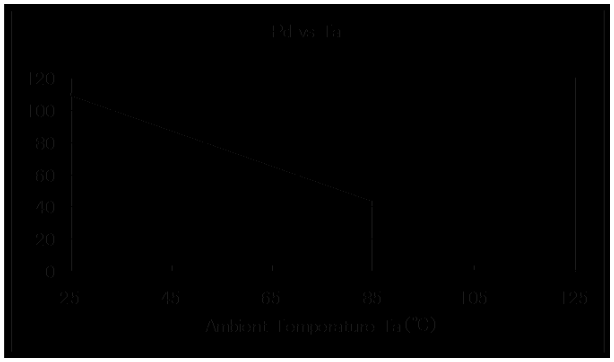
1. Measurement Condition

Condition : Mount on a board
Ambient : Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 114.3mm×76.2mm
Copper (Cu) traces occupy 74.2mm x 74.2mm of the board area in back faces.
Material : Glass Epoxy (FR-4)
Thickness : 1.6mm

2. Power Dissipation vs. Ambient temperature

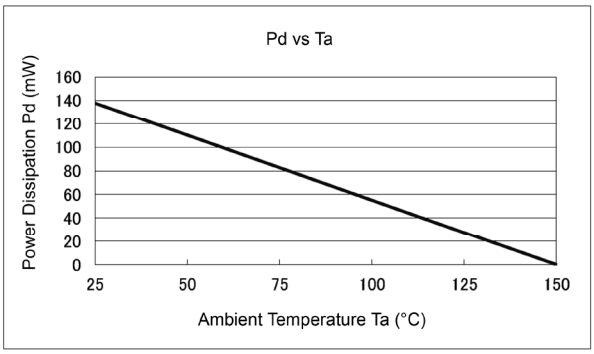
Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	110	909.09
85	44	



Board Mount (Tj max = 150℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	137.5	862.07
85	71.5	
150	0	



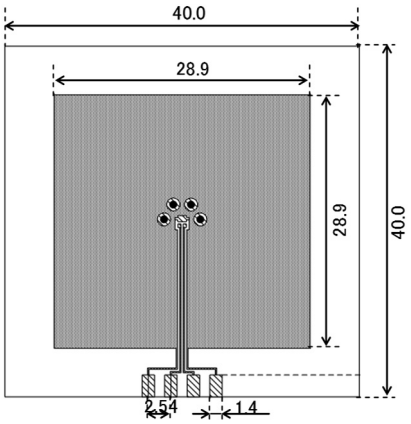
Package Power Dissipation

● USP-3 Power Dissipation

Power dissipation data for the USP-3 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

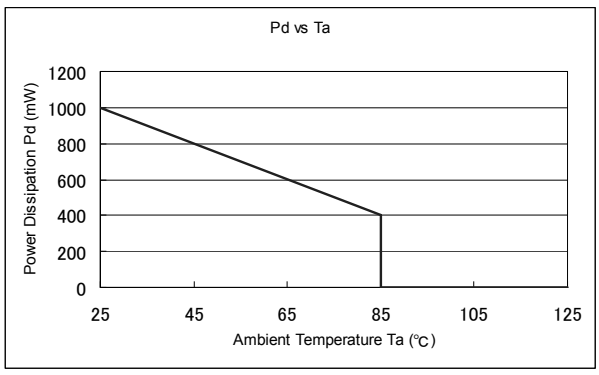


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	400	

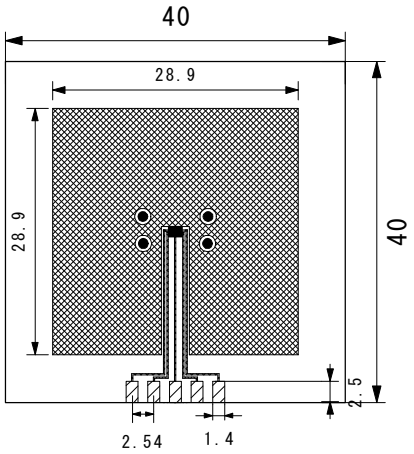


● USP-4D Power Dissipation

Power dissipation data for the USP-4D is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition : Mount on a board
Ambient : Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 40mm×40mm (1600mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material : Glass Epoxy (FR-4)
Thickness : 1.6mm
Through-hole : 4 x 0.8 Diameter

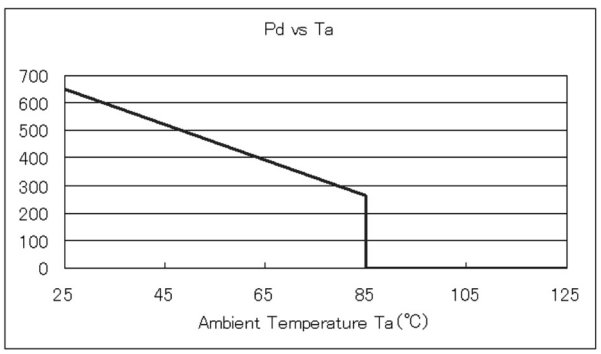


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	650	153.85
85	260	



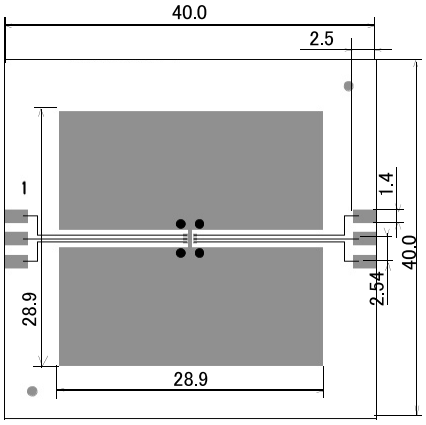
Package Power Dissipation

●USP-6B06 Power Dissipation

Power dissipation data for the USP-6B06 is shown in this page. The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces
Package heat-sink is tied to the copper traces
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

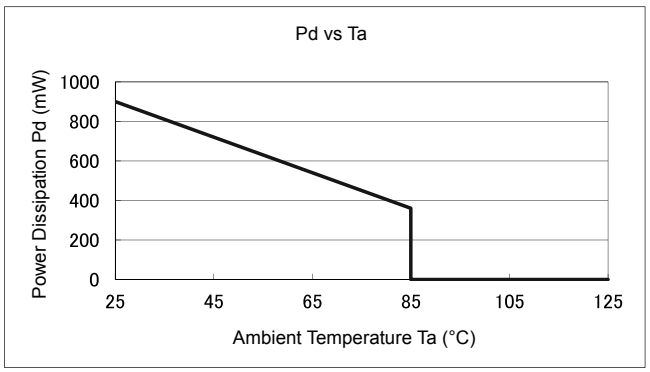


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	900	111.11
85	360	

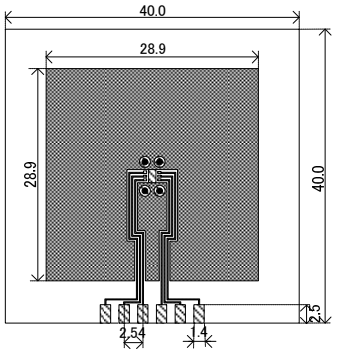


● USP-6C, USP-6B, USP-6EL, and USP-4 Power Dissipation

Power dissipation data for the USP-6C, USP-6B, USP-6EL, and USP-4 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6mm
Through-hole: 4 x 0.8 Diameter

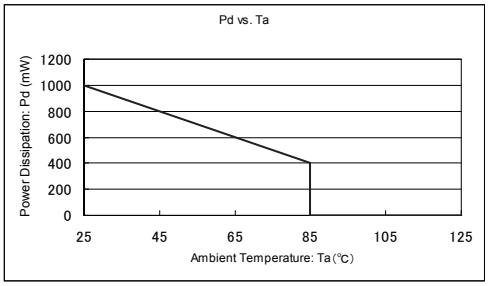


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

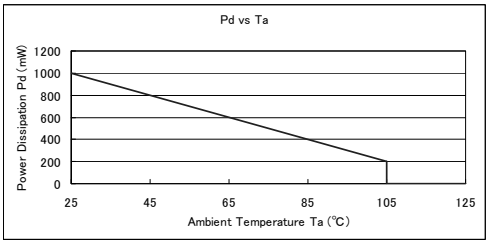
Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	400	



3. USP-6C Power Dissipation vs. Ambient temperature (105℃)

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
105	200	



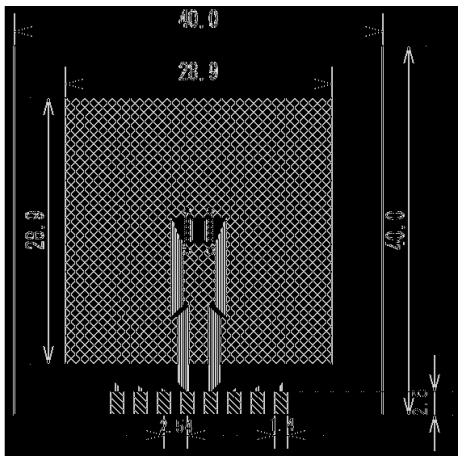
Package Power Dissipation

● USP-8 Power Dissipation

Power dissipation data for the USP-8 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package heat-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

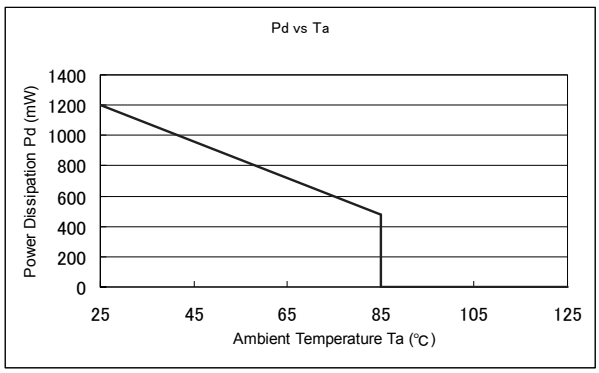


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1200	83.33
85	480	

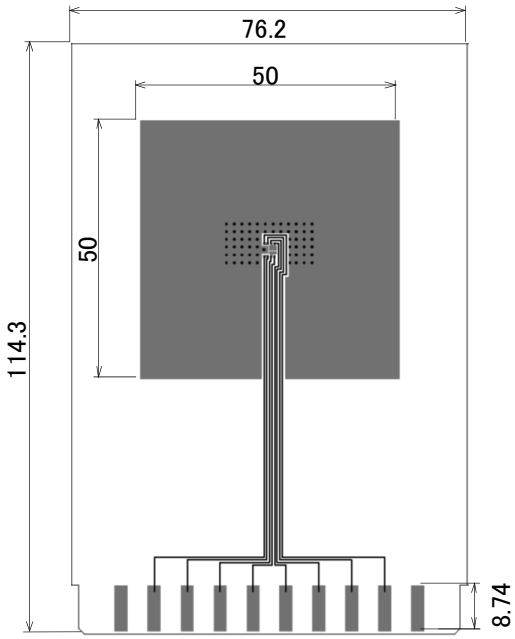


● USP-8B10 Power Dissipation

Power dissipation data for the USP-8B10 shown in this page.
The values of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

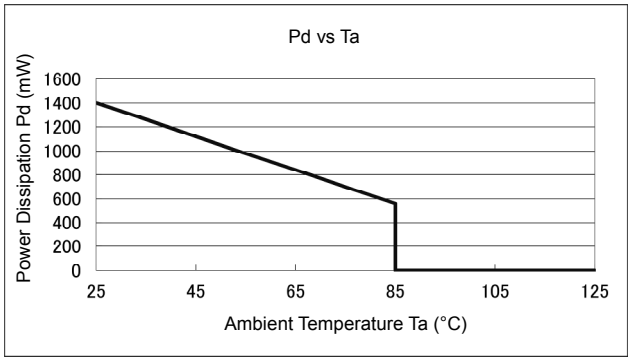
Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Copper foil 4 layer
Dimensions 76.2mm x 114.3mm (about 8700mm^2 in one side)
1st inner layer : 50mm×50mm connection with heat sink
2nd layer : 70mm×70mm connection with heat sink
3rd layer : 70mm×70mm connection with heat sink
4th layer : 50mm×50mm connection with heat sink
Material: Glass Epoxy (FR-4)
Thickness: 1.6mm
Through-hole: ϕ0.2mm 60pcs



2. Power Dissipation vs. Ambient Temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1400	71.43
85	560	



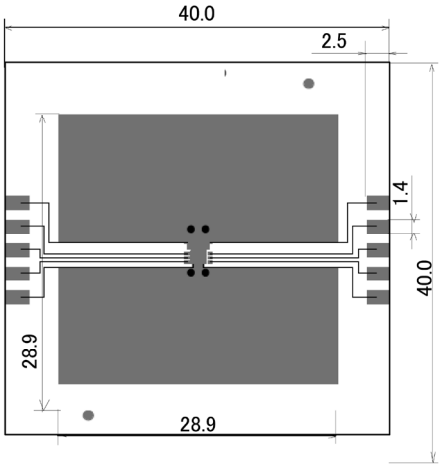
Package Power Dissipation

● USP-9B01 Power Dissipation

Power dissipation data for the USP-9B01 is shown in this page. Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40mm × 40mm (1600mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package hear-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6mm
Through-hole: 4 x 0.8 Diameter

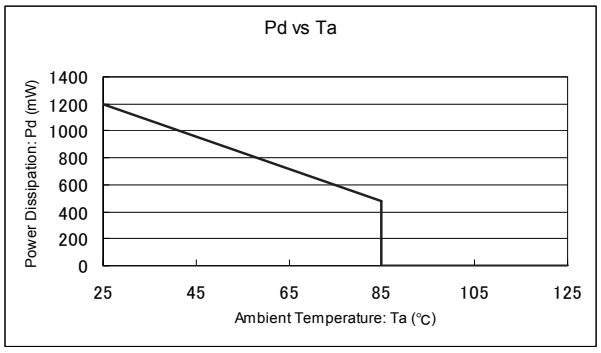


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1200	83.33
85	480	

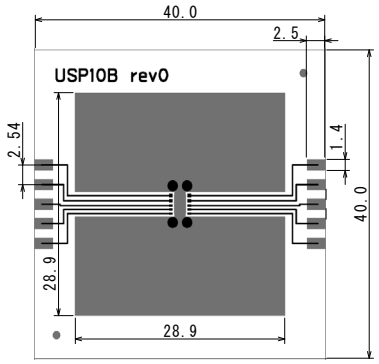


● USP-10B Power Dissipation

Power dissipation data for the USP-10B is shown in this page. The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: 40 x 40 mm (1600 mm^2 in one side)
Inner two metal layers, no large metal area in the front and back.
Copper Area: 1st Inner metal layer about 50%
4th Inner metal layer about 50%
Each Heatsink back metal is connected to the inner layers respectively.
2nd and 3rd Inner metal layer does not exist.
Material: Glass Epoxy (FR-4)
Thickness: 1.6mm
Through-hole: 4 x 0.8 Diameter

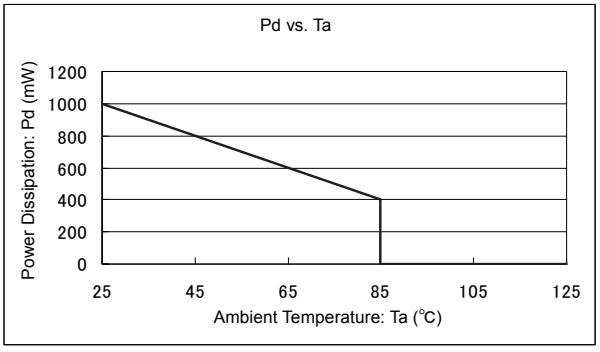


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	1000	100.00
85	400	



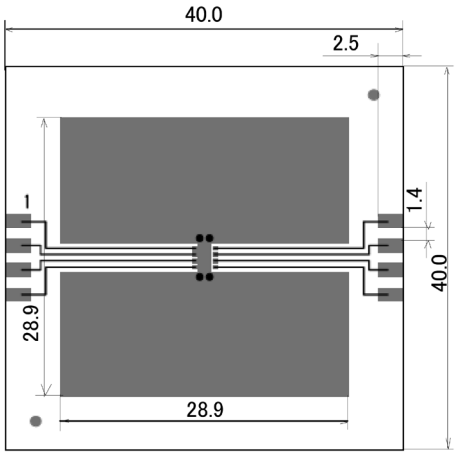
Package Power Dissipation

● USP-10B03 Power Dissipation

Power dissipation data for the USP-10B03 is shown in this page.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40mm × 40mm (1600mm^2 in one side)
Copper (Cu) traces occupy 50% of the board area in top and back faces.
Package hear-sink is tied to the copper traces.
Material: Glass Epoxy (FR-4)
Thickness: 1.6mm
Through-hole: 4 x 0.8 Diameter

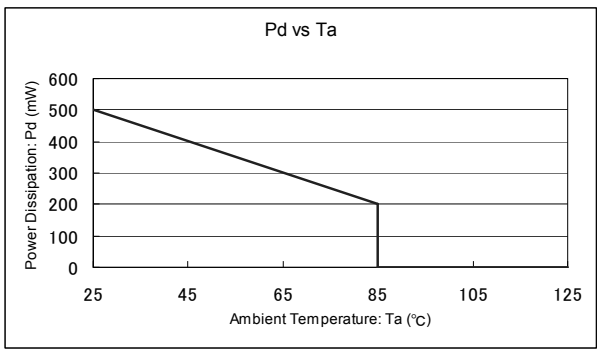


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient Temperature

Board Mount (Tjmax=125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	500	200.00
85	200	

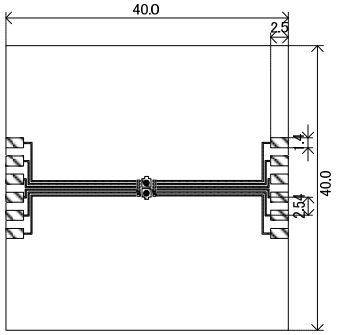


● USP-12B01 Power Dissipation

Power dissipation data for the USP-12B01 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board Dimensions: 40 x 40 mm (1600 mm^2 in one side)
Board: Inner two metal layers, no large metal area in the front and back.
Copper Area: 1st Inner Metal Layer about 50%
2nd Inner Metal Layer about 50%
Each Heatsink back metal is connected to the inner layers respectively.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 2 x 0.8 Diameter
(One through-hole connection per one heatsink back metal)



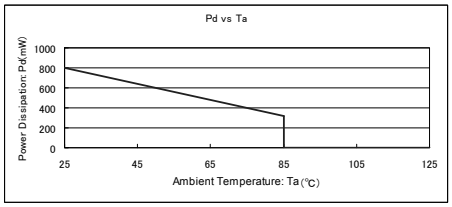
Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

1) 1ch Operation

Board Mount (Tj max = 125℃)

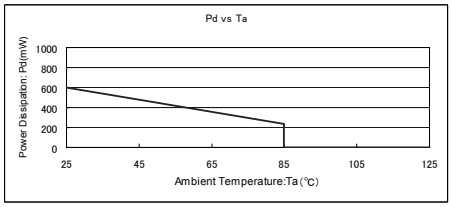
Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	800	125.00
85	320	



2) 2ch Operation

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	



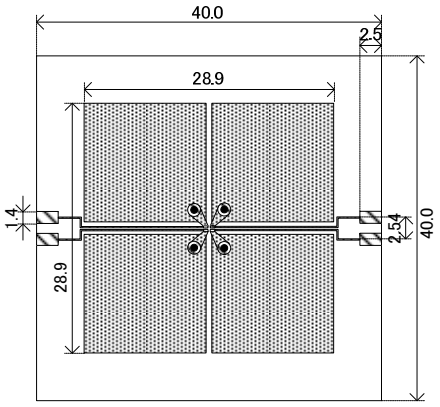
Package Power Dissipation

● USPN-4 Power Dissipation

Power dissipation data for the USPN-4 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the front and 50% of the back.
The copper area is divided into four block, one block is 12.5% of total.
The USPN-4 package has for terminals.
Each terminal connects one copper block in the front and one in the back.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

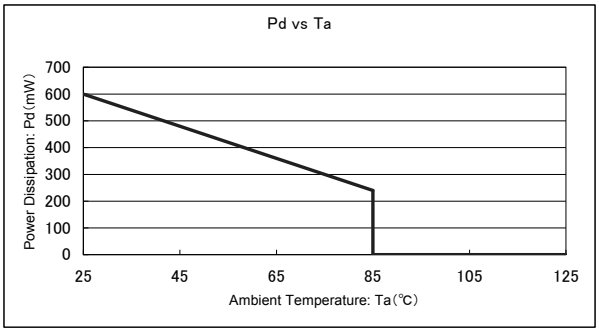


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	

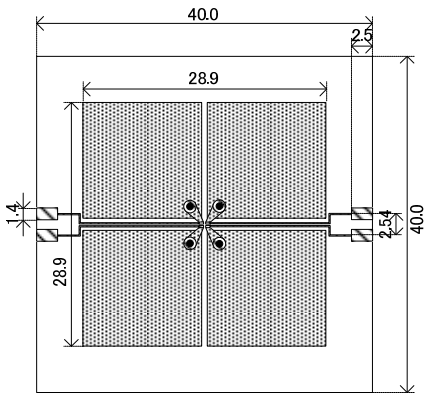


● USPN-4B02 Power Dissipation

Power dissipation data for the USPN-4B02 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: Dimensions 40 x 40 mm (1600 mm^2 in one side)
Copper (Cu) traces occupy 50% of the front and 50% of the back.
The copper area is divided into four block, one block is 12.5% of total.
The USPN-4 package has for terminals.
Each terminal connects one copper block in the front and one in the back.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

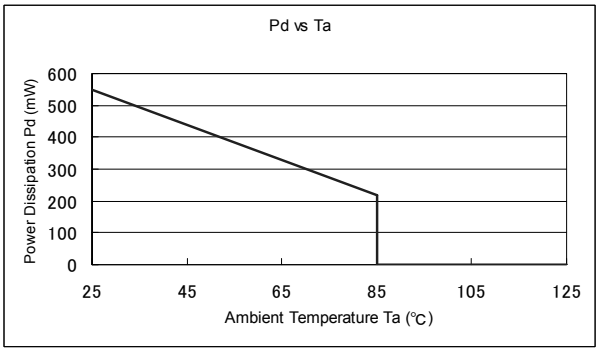


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	550	181.82
85	220	



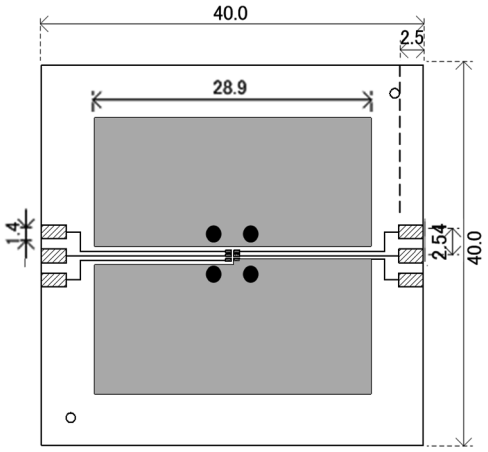
Package Power Dissipation

● USPN-6 Power Dissipation

Power dissipation data for the USPN-6 is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition : Mount on a board
Ambient : Natural convection
Soldering : Lead (Pb) free
Board : Dimensions 40mm x 40 mm (1600mm^2)
Copper (Cu) traces occupy 50% of the front and 50% of the back.
VSS pin is tied to the copper traces.
Material : Glass Epoxy (FR-4)
Thickness : 1.6mm
Through-hole : 4 x 0.8 Diameter

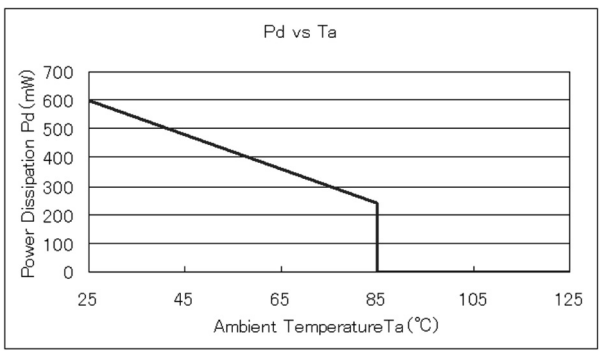


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	600	166.67
85	240	

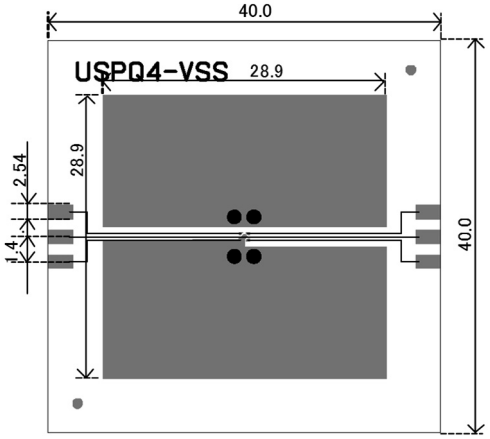


● USPQ-4B03 and USPQ-4B04 Power Dissipation

Power dissipation data for the USPQ-4B03 and USPQ-4B04 are shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: 40 x 40 mm (1600mm^2)
4 Copper Layers
Each layer is connected to the package heat-sink and terminal pin No.1.
Each layer has approximately 800mm^2 copper area.
Material: Glass Epoxy (FR-4)
Thickness: 1.6 mm
Through-hole: 4 x 0.8 Diameter

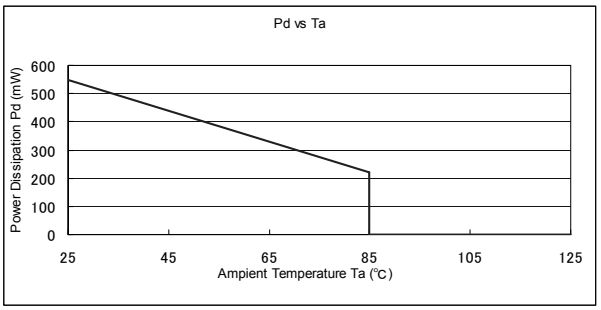


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	550	181.82
85	220	



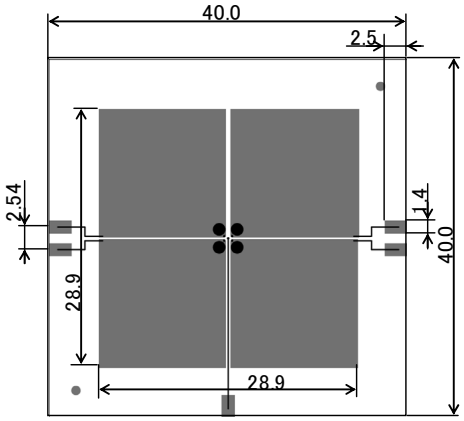
Package Power Dissipation

● WLP Power Dissipation

Power dissipation data for the WLP is shown in this page.
The value of power dissipation varies with the mount board conditions.
Please use this data as the reference data taken in the following condition.

1. Measurement Condition

Condition: Mount on a board
Ambient: Natural convection
Soldering: Lead (Pb) free
Board: 40mm × 40mm（1600mm^2 in one side）
Metal Area: 1st Metal Layer about 50%
2nd Inner Metal Layer about 50%
3rd Inner Metal Layer about 50%
4th Metal Layer about 50%
4 separations is each layer connected to each pin
Material: Glass Epoxy（FR-4）
Thickness: 1.6mm
Through-hole: 4 x 0.8 Diameter

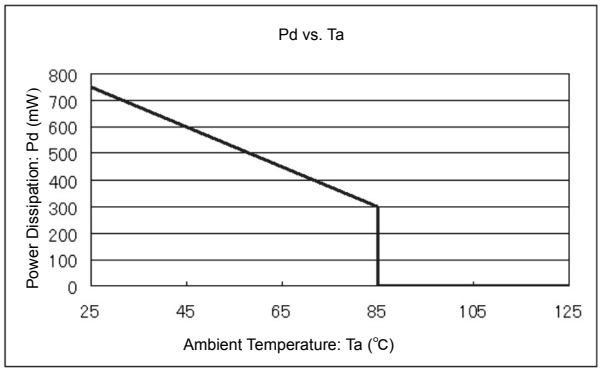


Evaluation Board (Unit: mm)

2. Power Dissipation vs. Ambient temperature

Board Mount (Tj max = 125℃)

Ambient Temperature (℃)	Power Dissipation Pd (mW)	Thermal Resistance (℃/W)
25	750	133.33
85	300	



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